



SEQUENCE LISTING

JUN 8 2004

JUN 8 2004

<118> BRILES et al.

<120> PNEUMOCOCCAL SURFACE PROTEIN C (PSPC), EPITOPIC REGIONS
AND STRAINS THEREOF AND USES THEREFOR

<130> 454312-3140

<140> 09/298,523

<141> 1999-04-23

<160> 77

<170> PatentIn Ver. 2.1

<210> 1

<211> 691

<212> PRT

<213> Streptococcus pneumoniae

<400> 1

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
1				5					10					15	
Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Phe	Leu	Gly
			20					25					30		
Gly	Val	Val	His	Ala	Glu	Gly	Val	Arg	Ser	Gly	Asn	Asn	Leu	Thr	Val
			35					40					45		
Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser	Lys	Lys	Tyr	Ala	Asp	Glu	Val	Glu
			50			55					60				
Ser	His	Leu	Glu	Ser	Ile	Leu	Lys	Asp	Val	Lys	Lys	Asn	Leu	Lys	Lys
65					70					75					80
Val	Gln	His	Thr	Gln	Asn	Val	Gly	Leu	Ile	Thr	Lys	Leu	Ser	Glu	Ile
				85					90					95	
Lys	Lys	Lys	Tyr	Leu	Tyr	Asp	Leu	Lys	Val	Asn	Val	Leu	Ser	Glu	Ala
			100					105					110		
Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr	Lys	Glu	Lys	Leu	Thr	Ala	Thr
		115					120					125			
Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Glu	Lys	Lys
		130				135					140				
Val	Ala	Glu	Ala	Gln	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu
145					150					155					160
Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys
				165					170					175	
Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala
			180					185					190		
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu
			195				200						205		

Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala
 210 215 220
 Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Lys Arg Lys
 225 230 235 240
 Ala Asp Ala Lys Leu Lys Glu Ala Val Glu Lys Asn Val Ala Thr Ser
 245 250 255
 Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu
 260 265 270
 Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser
 275 280 285
 Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser Leu Asn Met Ala Asn
 290 295 300
 Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp Glu Tyr Ile Lys Lys
 305 310 315 320
 Met Leu Ser Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn Val
 325 330 335
 Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Tyr Glu
 340 345 350
 Leu Ser Val Leu Lys Glu Asn Ser Lys Lys Glu Glu Leu Thr Ser Lys
 355 360 365
 Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln Phe Lys Lys Asp Thr
 370 375 380
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 385 390 395 400
 Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 405 410 415
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 420 425 430
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn
 435 440 445
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu
 450 455 460
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg
 465 470 475 480
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys
 485 490 495
 Lys Ala Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu
 500 505 510
 Glu Ala Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys
 515 520 525
 Glu Leu Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu

530					535					540					
Gly	Leu	Arg	Ala	Pro	Leu	Gln	Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys
545					550					555					560
Leu	Ser	Lys	Leu	Glu	Glu	Leu	Ser	Asp	Lys	Ile	Asp	Glu	Leu	Asp	Ala
				565					570					575	
Glu	Ile	Ala	Lys	Leu	Glu	Val	Gln	Leu	Lys	Asp	Ala	Glu	Gly	Asn	Asn
			580					585					590		
Asn	Val	Glu	Ala	Tyr	Phe	Lys	Glu	Gly	Leu	Glu	Lys	Thr	Thr	Ala	Glu
		595					600					605			
Lys	Lys	Ala	Glu	Leu	Glu	Lys	Ala	Glu	Ala	Asp	Leu	Lys	Lys	Ala	Val
		610					615					620			
Asp	Glu	Pro	Glu	Thr	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Ala	Pro	Ala	Pro
625					630					635					640
Glu	Lys	Pro	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro
				645					650					655	
Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro
			660					665					670		
Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Thr	Pro	Glu	Thr
		675					680					685			
Pro	Lys	Thr													
		690													

<210> 2

<211> 707

<212> PRT

<213> Streptococcus pneumoniae

<400> 2

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
1				5					10					15	

Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Phe	Leu	Gly
			20					25					30		

Gly	Val	Val	His	Ala	Glu	Gly	Val	Arg	Ser	Gly	Asn	Asn	Leu	Thr	Val
		35					40					45			

Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser	Lys	Lys	Tyr	Ala	Asp	Glu	Val	Glu
	50					55					60				

Ser	His	Leu	Glu	Ser	Ile	Leu	Lys	Asp	Val	Lys	Lys	Asn	Leu	Lys	Lys
65					70					75					80

Val	Gln	His	Thr	Gln	Asn	Val	Gly	Leu	Ile	Thr	Lys	Leu	Ser	Glu	Ile
				85					90					95	

Lys	Lys	Lys	Tyr	Leu	Tyr	Asp	Leu	Lys	Val	Asn	Val	Leu	Ser	Glu	Ala
			100					105						110	

Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr	Lys	Glu	Lys	Leu	Thr	Ala	Thr
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

115					120					125						
Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Glu	Lys	Lys	
130					135					140						
Val	Ala	Glu	Ala	Gln	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	
145					150					155					160	
Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	
165					170					175						
Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	
180					185					190						
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu	
195					200					205					.	
Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	
210					215					220						
Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys	
225					230					235					240	
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser	
245					250					255						
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu	
260					265					270						
Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	
275					280					285						
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn	
290					295					300						
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys	
305					310					315					320	
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Gly	Arg	Lys	His	Thr	Pro	Asn	Val	
325					330					335						
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	
340					345					350						
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	
355					360					365						
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	
370					375					380						
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	
385					390					395					400	
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	
405					410					415						
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	
420					425					430						
Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	
435					440					445						

Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu
 450 455 460
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg
 465 470 475 480
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys
 485 490 495
 Lys Ala Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu
 500 505 510
 Glu Ala Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys
 515 520 525
 Glu Leu Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu
 530 535 540
 Gly Leu Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys
 545 550 555 560
 Leu Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala
 565 570 575
 Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn
 580 585 590
 Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu
 595 600 605
 Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val
 610 615 620
 Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro Ala Pro
 625 630 635 640
 Glu Lys Pro Ala Glu Lys Pro Ala Pro Ala Pro Ala Pro Glu Lys Pro
 645 650 655
 Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro
 660 665 670
 Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro
 675 680 685
 Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Thr Pro Lys
 690 695 700
 Pro Glu Thr
 705

<210> 3
 <211> 711
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 3
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
20 25 30
Ser Val Val His Ala Thr Glu Asn Glu Gly Ile Thr Gln Val Ala Thr
35 40 45
Ser Tyr Asn Lys Ala Asn Glu Ser Gln Thr Glu His Arg Lys Ala Ala
50 55 60
Lys Gln Val Asp Glu Asp Ile Lys Lys Met Leu Ser Glu Ile Gln Glu
65 70 75 80
Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln Leu Asp Lys Arg Lys His
85 90 95
Thr Gln Asn Val Asn Leu Asn Arg Lys Leu Ser Ala Ile Gln Thr Lys
100 105 110
Tyr Leu Tyr Glu Leu Arg Val Leu Lys Glu Lys Ser Lys Lys Glu Glu
115 120 125
Leu Thr Ser Lys Thr Lys Lys Glu Leu Asp Ala Ala Phe Glu Lys Phe
130 135 140
Lys Lys Glu Glu Pro Glu Leu Thr Lys Lys Leu Ala Glu Ala Lys Gln
145 150 155 160
Lys Ala Lys Ala Gln Lys Glu Glu Asp Phe Arg Asn Tyr Pro Thr Asn
165 170 175
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val
180 185 190
Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Pro Arg Asn
195 200 205
Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val Glu Ser Lys Lys Ala
210 215 220
Glu Ala Thr Arg Leu Glu Glu Ile Lys Thr Glu Arg Lys Lys Ala Glu
225 230 235 240
Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala Ala Glu
245 250 255
Ala Lys Gln Lys Val Asp Thr Lys Glu Gln Gly Lys Pro Lys Arg Arg
260 265 270
Ala Lys Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu
275 280 285
Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro
290 295 300
Ser Pro Ser Leu Asn Ala Met Ala Asn Glu Ser Gln Thr Glu His Arg
305 310 315 320
Lys Asp Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln Leu
325 330 335

Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	Asn	Leu	Asn	Ile	Lys	Leu	Ser		
			340					345					350				
Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	Leu	Ser	Val	Leu	Lys	Glu	Asn		
		355					360					365					
Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	Thr	Lys	Ala	Glu	Leu	Thr	Ala		
	370					375					380						
Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Pro	Glu	Lys	Lys	Val		
385					390					395					400		
Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Lys	Asp		
				405					410					415			
Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr		
			420					425						430			
Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Lys	Ala	Glu		
		435					440					445					
Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu	Ser	Arg	Asn	Glu	Glu	Lys		
	450					455					460						
Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr		
465					470					475					480		
Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala		
				485				490						495			
Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys	Lys	Ala	Ala	Glu	Ala	Lys	Gln		
			500					505					510				
Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu	Glu	Ala	Lys	Ile	Ala	Glu	Leu		
		515					520					525					
Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys	Glu	Leu	Lys	Glu	Ile	Asp	Glu		
	530					535					540						
Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu	Gly	Leu	Arg	Ala	Pro	Leu	Gln		
545					550					555					560		
Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys	Leu	Ser	Lys	Leu	Glu	Glu	Leu		
				565					570					575			
Ser	Asp	Lys	Ile	Asp	Glu	Leu	Asp	Ala	Glu	Ile	Ala	Lys	Leu	Glu	Val		
			580					585					590				
Gln	Leu	Lys	Asp	Ala	Glu	Gly	Asn	Asn	Asn	Val	Glu	Ala	Tyr	Phe	Lys		
		595					600					605					
Glu	Gly	Leu	Glu	Lys	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu	Leu	Glu	Lys		
	610					615					620						
Ala	Glu	Ala	Asp	Leu	Lys	Lys	Ala	Val	Asp	Glu	Pro	Glu	Thr	Pro	Ala		
625					630					635					640		
Pro	Ala	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Glu	Lys	Pro		
				645					650					655			

Ala Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro
660 665 670

Ala Glu Lys Pro Ala Glu Lys Pro Ala Glu Glu Pro Ala Glu Lys Pro
675 680 685

Ala Pro Ala Pro Glu Lys Pro Ala Pro Thr Pro Glu Lys Pro Ala Pro
690 695 700

Thr Pro Glu Thr Pro Lys Thr
705 710

<210> 4
<211> 496
<212> PRT
<213> Streptococcus pneumoniae

<400> 4
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Ser
20 25 30

Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser
35 40 45

Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val Val
50 55 60

Asp Ile Lys Lys Met Leu Ser Glu Ile Gln Glu Tyr Ile Lys Lys Met
65 70 75 80

Leu Ser Glu Ile Gln Leu Asp Lys Arg Lys His Thr Gln Asn Val Asn
85 90 95

Leu Asn Arg Lys Leu Ser Ala Ile Gln Thr Lys Tyr Leu Tyr Glu Leu
100 105 110

Arg Val Leu Lys Glu Lys Ser Lys Lys Glu Glu Leu Thr Ser Lys Thr
115 120 125

Lys Lys Glu Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Leu
130 135 140

Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu Ala
145 150 155 160

Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro
165 170 175

Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp Val
180 185 190

Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
195 200 205

Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu Ser
210 215 220

Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Lys
 225 230 235 240
 Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys
 245 250 255
 Ala Ala Glu Ala Lys Gln Lys Val Asp Thr Lys Glu Gln Gly Lys Pro
 260 265 270
 Lys Arg Arg Ala Lys Arg Gly Val Ser Gly Glu Leu Ala Thr Pro Asp
 275 280 285
 Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu
 290 295 300
 Thr Leu Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala
 305 310 315 320
 Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu
 325 330 335
 Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu
 340 345 350
 Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu
 355 360 365
 Val Lys Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln
 370 375 380
 Ala Lys Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu
 385 390 395 400
 Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys
 405 410 415
 Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln
 420 425 430
 Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys
 435 440 445
 Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu
 450 455 460
 Glu Asp Tyr Ala Arg Arg Ser Glu Glu Tyr Asn Arg Leu Thr Gln Gln
 465 470 475 480
 Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr
 485 490 495

<210> 5

<211> 444

<212> PRT

<213> Streptococcus pneumoniae

<400> 5

Glu	Asn	Glu	Gly	Ser	Thr	Gln	Ala	Ala	Thr	Ser	Ser	Asn	Met	Ala	Lys
1				5					10					15	
Thr	Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	Val	Asp	Glu	Tyr	Ile	Glu
			20					25					30		
Lys	Met	Leu	Glu	Arg	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn
		35					40					45			
Val	Ala	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Arg
	50					55					60				
Glu	Leu	Asn	Val	Leu	Glu	Glu	Lys	Ser	Lys	Asp	Glu	Leu	Pro	Ser	Glu
65					70					75					80
Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Lys	Phe	Lys	Lys	Asp	Thr
				85					90					95	
Leu	Lys	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	Lys	Lys	Val	Glu	Glu	Ala
			100					105					110		
Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro
		115					120					125			
Thr	Asn	Thr	Tyr	Lys	Thr	Glu	Leu	Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys
	130					135					140				
Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser
145					150					155					160
Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys
				165					170					175	
Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys
			180					185					190		
Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala
		195					200					205			
Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg
	210					215					220				
Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala
225					230					235					240
Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser
				245					250					255	
Leu	Lys	Leu	Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu
		260						265					270		
Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn
		275					280					285			
Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp	Leu	Glu	Ile	Ala	Glu	Ser
	290					295					300				
Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala
305					310					315					320

Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys Val
 325 330 335
 Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp
 340 345 350
 Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu Asp
 355 360 365
 Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Thr
 370 375 380
 Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln Pro
 385 390 395 400
 Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala Arg
 405 410 415
 Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro Lys
 420 425 430
 Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr
 435 440

<210> 6
 <211> 481
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 6
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
 35 40 45
 Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val
 50 55 60
 Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg
 65 70 75 80
 Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile
 85 90 95
 Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys
 100 105 110
 Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu
 115 120 125
 Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala
 130 135 140
 Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu
 145 150 155 160

Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	165	170	175
Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	180	185	190
Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	195	200	205
Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	210	215	220
Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	225	230	235
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly	245	250	255
Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	260	265	270
Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	275	280	285
Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Glu	290	295	300
Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	305	310	315
Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp	325	330	335
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	340	345	350
Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	355	360	365
Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	370	375	380
Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	385	390	395
Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	405	410	415
Gln	Pro	Ala	Pro	Ala	Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	Glu	420	425	430
Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	Ala	435	440	445
Glu	Glu	Asp	Tyr	Ala	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	Thr	Gln	450	455	460
Gln	Gln	Pro	Pro	Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Ser	Thr	Pro	Lys	465	470	475
																		480

Thr

<210> 7

<211> 307

<212> PRT

<213> Streptococcus pneumoniae

<400> 7

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
20 25 30

Gly Val Val His Ala Glu Gly Val Arg Ser Glu Asn Thr Pro Lys Val
35 40 45

Thr Ser Ser Gly Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu
50 55 60

Asp Arg Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Ile Ser
65 70 75 80

Ala Ile Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys
85 90 95

Ser Lys Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala
100 105 110

Phe Glu Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala
115 120 125

Glu Ala Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln
130 135 140

Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu
145 150 155 160

Glu Leu Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu
165 170 175

Glu Leu Val Lys Glu Glu Ala Lys Glu Phe Arg Asn Glu Gly Thr Ile
180 185 190

Lys Gln Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg
195 200 205

Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys
210 215 220

Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln
225 230 235 240

Pro Gln Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro
245 250 255

Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln
260 265 270

Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
275 280 285

Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
290 295 300

Pro Lys Thr
305

<210> 8

<211> 434

<212> PRT

<213> Streptococcus pneumoniae

<400> 8

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
20 25 30

Gly Val Val His Ala Glu Gly Val Arg Ser Glu Asn Thr Pro Lys Val
35 40 45

Thr Ser Ser Gly Asp Glu Val Asp Glu Tyr Ile Lys Lys Met Leu Ser
50 55 60

Glu Ile Gln Leu Asp Lys Arg Lys His Thr His Asn Phe Ala Leu Asn
65 70 75 80

Leu Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Tyr Lys Leu Lys Val
85 90 95

Asn Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Thr Ser Lys Thr Lys
100 105 110

Lys Glu Val Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Leu Lys
115 120 125

Leu Gly Glu Lys Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala Lys
130 135 140

Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr
145 150 155 160

Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys
165 170 175

Leu Lys Glu Ala Glu Leu Glu Leu Lys Glu Glu Ala Lys Thr Arg
180 185 190

Asn Glu Asp Thr Ile Asn Gln Ala Lys Ala Lys Val Lys Ser Glu Gln
195 200 205

Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Gln Ala
210 215 220

Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu

225 230 235 240
 Glu Ala Lys Arg Lys Ala Glu Ala Glu Glu Val Lys Asp Lys Leu Lys
 245 250 255
 Arg Arg Thr Lys Arg Ala Val Pro Gly Glu Pro Ala Thr Pro Asp Lys
 260 265 270
 Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr
 275 280 285
 Leu Pro Ser Pro Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Gln
 290 295 300
 Lys Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu
 305 310 315 320
 Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu
 325 330 335
 Ile Ala Glu Ser Asp Val Lys Val Lys Glu Lys Pro Ala Glu Gln Pro
 340 345 350
 Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys Pro Thr Glu Glu Pro Glu
 355 360 365
 Asn Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Pro Lys Pro Glu
 370 375 380
 Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala
 385 390 395 400
 Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr
 405 410 415
 Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro
 420 425 430

Lys Thr

<210> 9

<211> 487

<212> PRT

<213> Streptococcus pneumoniae

<400> 9

Met Phe Ala Ser Lys Asn Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Met Gly
 20 25 30

Ser Val Val His Ala Thr Glu Lys Glu Val Thr Thr Gln Val Ala Thr
 35 40 45

Ser Phe Asn Lys Ala Asn Lys Ser Gln Thr Glu His Met Lys Ala Ala
 50 55 60

Lys Gln Val Asp Glu Tyr Ile Thr Lys Lys Leu Gln Leu Asp Arg Arg

65					70						75					80
Lys	His	Thr	Gln	Asn	Val	Gly	Leu	Leu	Thr	Lys	Leu	Gly	Val	Ile	Lys	
				85					90					95		
Thr	Glu	Tyr	Leu	His	Arg	Leu	Ser	Val	Ser	Lys	Glu	Lys	Ser	Glu	Ala	
			100					105					110			
Glu	Leu	Pro	Ser	Glu	Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Gln	
		115					120					125				
Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Gly	Lys	Lys	Val	Ala	Glu	
	130					135					140					
Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	
145					150					155					160	
Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	
				165					170					175		
Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	
			180					185					190			
Leu	Val	Lys	Glu	Glu	Ala	Lys	Gly	Ser	Arg	Asn	Glu	Gln	Lys	Val	Asn	
		195					200					205				
Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	
	210					215					220					
Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Gln	Ala	Glu	Thr	Thr	Arg	Leu	Glu	
225					230					235					240	
Asn	Ile	Lys	Thr	Asp	Arg	Glu	Lys	Ala	Glu	Glu	Ala	Lys	Arg	Lys	Ala	
				245					250					255		
Asp	Ala	Lys	Glu	Gln	Asp	Glu	Ser	Lys	Arg	Arg	Val	Lys	Gly	Gly	Val	
			260					265					270			
Pro	Gly	Glu	Gln	Ala	Thr	Leu	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	
		275					280					285				
Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Lys	
	290					295					300					
Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	
305					310					315					320	
Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	
				325					330					335		
Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	
			340					345					350			
Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	
		355					360					365				
Arg	Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Glu	Val	Glu	Ser	Lys	
	370					375					380					
Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	
385					390					395					400	

Ala Glu Glu Ala Lys Arg Lys Ala Ala Glu Ser Glu Lys Val Lys Glu
405 410 415

Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys
420 425 430

Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala
435 440 445

Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser
450 455 460

Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu
465 470 475 480

Lys Pro Ala Gln Pro Ser Thr
485

<210> 10
<211> 483
<212> PRT
<213> Streptococcus pneumoniae

<400> 10
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
35 40 45

Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val
50 55 60

Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg
65 70 75 80

Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile
85 90 95

Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys
100 105 110

Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu
115 120 125

Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala
130 135 140

Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu
145 150 155 160

Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu
165 170 175

Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu
180 185 190

Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	
		195					200					205				
Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	
		210				215					220					
Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	
225					230					235					240	
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly	
				245					250					255		
Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	
			260					265					270			
Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	
		275					280					285				
Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	
		290				295					300					
Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	
305					310					315					320	
Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	
				325					330					335		
Asp	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	
			340					345					350			
Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Thr	
		355					360					365				
Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	
		370				375					380					
Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	
385					390					395					400	
Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	
				405					410					415		
Pro	Gln	Pro	Ala	Pro	Ala	Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	
			420					425					430			
Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	
		435					440					445				
Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	
		450				455					460					
Ile	Gln	Gln	Gln	Pro	Pro	Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Phe	Thr	
465					470					475					480	
Pro	Lys	Thr														

<210> 11
<211> 329

<212> PRT

<213> Streptococcus pneumoniae

<400> 11

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys	
1				5					10					15		
Phe	Ser	Val	Gly	Val	Ala	Ser	Val	Val	Val	Ala	Ser	Leu	Val	Met	Gly	
			20					25					30			
Ser	Val	Val	His	Ala	Thr	Glu	Asn	Glu	Gly	Ala	Thr	Gln	Val	Pro	Thr	
			35				40					45				
Ser	Ser	Asn	Arg	Ala	Asn	Glu	Ser	Gln	Ala	Glu	Gln	Gly	Glu	Gln	Pro	
	50					55					60					
Lys	Lys	Leu	Asp	Ser	Glu	Arg	Asp	Lys	Ala	Lys	Thr	Ala	Val	Ser	Glu	
65					70					75					80	
Tyr	Lys	Glu	Lys	Lys	Val	Ser	Glu	Ile	Tyr	Thr	Lys	Leu	Glu	Arg	Asp	
				85					90					95		
Arg	His	Lys	Asp	Thr	Val	Asp	Leu	Val	Asn	Lys	Leu	Gln	Glu	Ile	Lys	
			100					105					110			
Asn	Glu	Tyr	Leu	Asn	Lys	Ile	Val	Gln	Ser	Thr	Ser	Lys	Thr	Glu	Ile	
		115					120					125				
Gln	Gly	Leu	Ile	Thr	Thr	Ser	Arg	Ser	Lys	Leu	Asp	Glu	Ala	Val	Ser	
	130					135					140					
Lys	Tyr	Lys	Lys	Ala	Pro	Ser	Ser	Ser	Ser	Ser	Ser	Gly	Ser	Ser	Thr	
145					150					155					160	
Lys	Pro	Glu	Ala	Ser	Asp	Thr	Ala	Lys	Pro	Asn	Lys	Pro	Thr	Glu	Leu	
				165					170					175		
Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	
			180					185					190			
Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Tyr	Arg	Asn	Tyr	Pro	Thr	Ile	
	195						200					205				
Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	
	210					215					220					
Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	
225					230					235					240	
Asn	Glu	Glu	Lys	Val	Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Glu	Glu	
				245					250					255		
Thr	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	
			260					265					270			
Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	
		275					280					285				
Lys	Pro	Ala	Glu	Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	
	290					295					300					

Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys
305 310 315 320

Pro Ala Gln Pro Ser Thr Pro Lys Thr
325

<210> 12

<211> 515

<212> PRT

<213> Streptococcus pneumoniae

<400> 12

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr
35 40 45

Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro
50 55 60

Lys Lys Leu Asp Ser Glu Arg Asp Lys Ala Arg Lys Glu Val Glu Glu
65 70 75 80

Tyr Val Lys Lys Ile Val Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys
85 90 95

Arg His Thr Ile Thr Val Ala Leu Val Asn Glu Leu Asn Asn Ile Lys
100 105 110

Asn Glu Tyr Leu Asn Lys Ile Val Glu Ser Thr Ser Glu Ser Gln Leu
115 120 125

Gln Ile Leu Met Met Glu Ser Arg Ser Lys Val Asp Glu Ala Val Ser
130 135 140

Lys Phe Glu Lys Asp Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr
145 150 155 160

Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro
165 170 175

Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu Ala Glu Lys
180 185 190

Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile
195 200 205

Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val
210 215 220

Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg
225 230 235 240

Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln
245 250 255

Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala
 260 265 270
 Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro
 275 280 285
 Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp
 290 295 300
 Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu
 305 310 315 320
 Thr Leu Pro Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala
 325 330 335
 Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu
 340 345 350
 Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu
 355 360 365
 Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu
 370 375 380
 Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln
 385 390 395 400
 Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu
 405 410 415
 Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys
 420 425 430
 Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln
 435 440 445
 Pro Ala Pro Ala Pro Lys Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro
 450 455 460
 Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln
 465 470 475 480
 Ala Glu Glu Glu Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
 485 490 495
 Thr Leu Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
 500 505 510
 Pro Lys Thr
 515

<210> 13

<211> 513

<212> PRT

<213> Streptococcus pneumoniae

<400> 13

Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15

Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
20 25 30
Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr
35 40 45
Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro
50 55 60
Lys Lys Leu Asp Ser Glu Arg Asp Lys Ala Arg Lys Glu Val Glu Glu
65 70 75 80
Tyr Val Lys Lys Ile Val Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys
85 90 95
Arg His Thr Ile Thr Val Ala Leu Val Asn Glu Leu Asn Asn Ile Lys
100 105 110
Asn Glu Tyr Leu Asn Lys Ile Val Glu Ser Thr Ser Glu Ser Gln Leu
115 120 125
Gln Ile Leu Met Met Glu Ser Arg Ser Lys Val Asp Glu Ala Val Ser
130 135 140
Lys Phe Glu Lys Asp Ser Ser Ser Ser Ser Ser Ser Asp Ser Ser Thr
145 150 155 160
Lys Pro Glu Ala Ser Asp Thr Ala Lys Pro Asn Lys Pro Thr Glu Pro
165 170 175
Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu Ala Glu Lys
180 185 190
Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Ile
195 200 205
Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Glu Val
210 215 220
Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Asn Glu Pro Arg
225 230 235 240
Asp Glu Gln Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser Lys Gln
245 250 255
Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala
260 265 270
Glu Glu Glu Ala Lys Arg Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro
275 280 285
Lys Gly Arg Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp
290 295 300
Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu
305 310 315 320
Thr Leu Pro Ser Pro Ser Leu Lys Pro Glu Lys Lys Val Ala Glu Ala
325 330 335
Glu Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu

340	345	350
Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu		
355	360	365
Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu Leu		
370	375	380
Val Lys Glu Glu Ala Lys Glu Pro Arg Asn Glu Glu Lys Val Lys Gln		
385	390	395
Ala Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu		
405	410	415
Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys		
420	425	430
Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln		
435	440	445
Pro Ala Pro Ala Pro Lys Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro		
450	455	460
Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln		
465	470	475
Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu		
485	490	495
Thr Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr		
500	505	510
Pro		

<210> 14
 <211> 589
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 14
 Glu Gly Val Arg Ser Gly Asn Asn Leu Thr Val Thr Ser Ser Gly Gln
 1 5 10 15
 Asp Ile Ser Lys Lys Tyr Ala Asp Glu Val Glu Ser His Leu Glu Ser
 20 25 30
 Ile Leu Lys Asp Val Lys Lys Asn Leu Lys Lys Val Gln His Thr Gln
 35 40 45
 Asn Val Gly Leu Ile Thr Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu
 50 55 60
 Tyr Asp Leu Lys Val Asn Val Leu Ser Glu Ala Glu Leu Thr Ser Lys
 65 70 75 80
 Thr Lys Glu Thr Lys Glu Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys
 85 90 95
 Lys Asp Thr Leu Pro Thr Glu Pro Glu Lys Lys Val Ala Glu Ala Gln

100						105						110					
Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Lys		
		115					120						125				
Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu		
	130						135				140						
Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	Glu	Leu	Glu	Leu	Val		
145					150					155					160		
Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala		
				165					170					175			
Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	Thr	Arg	Leu	Lys	Lys		
			180					185					190				
Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Asp	Ala	Lys	Leu		
		195					200						205				
Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser	Glu	Gln	Asp	Lys	Pro		
	210						215				220						
Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu	Leu	Ala	Thr	Pro	Asp		
225					230					235					240		
Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu		
				245					250					255			
Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn	Glu	Ser	Gln	Thr	Glu		
			260					265					270				
His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys	Met	Leu	Ser	Glu	Ile		
		275					280						285				
Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	Asn	Leu	Asn	Ile	Lys		
	290						295				300						
Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	Leu	Ser	Val	Leu	Lys		
305					310					315					320		
Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	Thr	Lys	Ala	Glu	Leu		
				325					330					335			
Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Pro	Glu	Lys		
			340					345					350				
Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala		
		355						360					365				
Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr		
	370						375				380						
Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu		
385					390					395					400		
Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu	Ser	Arg	Asn	Glu		
				405					410					415			
Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu		
			420					425					430				

Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu
435 440 445

Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys Lys Ala Ala Glu Ala
450 455 460

Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala
465 470 475 480

Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile
485 490 495

Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro
500 505 510

Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu
515 520 525

Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala Glu Ile Ala Lys Leu
530 535 540

Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn Asn Val Glu Ala Tyr
545 550 555 560

Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu Lys Lys Ala Glu Leu
565 570 575

Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val Asp Glu
580 585

<210> 15
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 15
Lys Thr Gly Trp Lys Gln Glu Asn Gly Asn Trp Tyr Phe Tyr Asn Thr
1 5 10 15

Asp Gly Ser Met Ala
20

<210> 16
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 16
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Met
1 5 10 15

Gly Ala Met Ala
20

<210> 17
<211> 20
<212> PRT

<213> Streptococcus pneumoniae

<400> 17

Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn
1				5					10					15	

Gly Ser Met Ala
20

<210> 18

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 18

Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn
1				5					10					15	

Gly Ala Met Ala
20

<210> 19

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 19

Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn
1				5					10					15	

Gly Asp Met Ala
20

<210> 20

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 20

Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn
1				5					10					15	

Gly Ala Met Ala
20

<210> 21

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 21

Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn
1				5					10					15	

Gly Asp Met Ala
20

<210> 22
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 22
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15
Gly Asp Met Ala
20

<210> 23
<211> 19
<212> PRT
<213> Streptococcus pneumoniae

<400> 23
Thr Gly Trp Leu Gln Tyr Asn Ser Trp Tyr Tyr Leu Asn Ala Asn Gly
1 5 10 15
Asp Met Ala

<210> 24
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 24
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15
Gly Ala Met Lys Ala
20

<210> 25
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 25
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser
1 5 10 15
Gly Ala Leu Ala
20

<210> 26
<211> 18
<212> PRT
<213> Streptococcus pneumoniae

<400> 26
Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val Asn

<210> 27

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 27

Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 28

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<220>

<221> UNSURE

<222> (1)..(20)

<223> amino acid "X" can be any amino acid

<400> 28

Thr Gly Trp Leu Gln Xaa Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 29

<211> 17

<212> PRT

<213> Streptococcus pneumoniae

<400> 29

Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 30

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 30

Ile Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp
1 5 10 15

Gly Ser Met Ala
20

<210> 31
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 31
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 32
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 32
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 33
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 33
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ala Met Ala
20

<210> 34
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 34
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Asp Met Ala
20

<210> 35
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 35
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Asp Met Ala
20

<210> 36
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 36
Thr Gly Trp Ala Lys Val His Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ser Met Ala
20

<210> 37
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 37
Thr Gly Trp Val Lys Asp Gly Glu Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15

Gly Ser Met Lys Ala
20

<210> 38
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 38
Asn Gln Trp Phe Gln Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu
1 5 10 15

Gly Ser Leu Ser
20

<210> 39
<211> 17
<212> PRT
<213> Streptococcus pneumoniae

<400> 39
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 40
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 40

Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn
1 5 10 15

Gly Ser Met Ala
20

<210> 41

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 41

Lys Thr Gly Trp Lys Gln Glu Asn Gly Asn Trp Tyr Phe Tyr Asn Thr
1 5 10 15

Asp Gly Ser Met Ala
20

<210> 42

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 42

Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp
1 5 10 15

Gly Ser Met Ala
20

<210> 43

<211> 20

<212> PRT

<213> Streptococcus pneumoniae

<400> 43

Ile Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp
1 5 10 15

Gly Ser Met Ala
20

<210> 44

<211> 21

<212> PRT

<213> Streptococcus pneumoniae

<400> 44

Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15

Gly Ala Met Lys Ala
20

<210> 45
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 45
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15
Gly Ala Met Lys Ala
20

<210> 46
<211> 21
<212> PRT
<213> Streptococcus pneumoniae

<400> 46
Thr Gly Trp Val Lys Asp Gly Glu Thr Trp Tyr Tyr Leu Glu Ala Ser
1 5 10 15
Gly Ser Met Lys Ala
20

<210> 47
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 47
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser
1 5 10 15
Gly Ala Leu Ala
20

<210> 48
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 48
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu
1 5 10 15
Gly Ala Leu Ala
20

<210> 49
<211> 20
<212> PRT
<213> Streptococcus pneumoniae

<400> 49
Asn Gln Trp Phe Gln Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Leu
1 5 10 15

Gly Ser Leu Ser
20

<210> 50
<211> 18
<212> PRT
<213> Streptococcus pneumoniae

<400> 50
Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val Asn

<210> 51
<211> 17
<212> PRT
<213> Streptococcus pneumoniae

<400> 51
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 52
<211> 17
<212> PRT
<213> Streptococcus pneumoniae

<400> 52
Val Asn Thr Thr Val Asp Gly Tyr Lys Val Asn Ala Asn Gly Glu Trp
1 5 10 15

Val

<210> 53
<211> 1620
<212> DNA
<213> Streptococcus pneumoniae

<220>
<221> CDS
<222> (1)..(1617)
<223> coding sequence for SpsA

<400> 53
atg ttt gca tca aaa agc gaa aga aaa gta cat tat tca att cgt aaa 48
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

ttt agt att gga gta gct agt gta gct gtt gcc agt ctt gtt atg gga 96
Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
20 25 30

agt gtg gtt cat gcg aca gag aac gag gga agt acc caa gca gcc act	144
Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr	
35 40 45	
tct tct aat atg gca aag aca gaa cat agg aaa gct gct aaa caa gtc	192
Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val	
50 55 60	
gtc gat gaa tat ata gaa aaa atg ttg agg gag att caa cta gat aga	240
Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg	
65 70 75 80	
aga aaa cat acc caa aat gtc gcc tta aac ata aag ttg agc gca att	288
Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile	
85 90 95	
aaa acg aag tat ttg cgt gaa tta aat gtt tta gaa gag aag tcg aaa	336
Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys	
100 105 110	
gat gag ttg ccg tca gaa ata aaa gca aag tta gac gca gct ttt gag	384
Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu	
115 120 125	
aag ttt aaa aaa gat aca ttg aaa cca gga gaa aag gta gca gaa gct	432
Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala	
130 135 140	
aag aag aag gtt gaa gaa gct aag aaa aaa gcc gag gat caa aaa gaa	480
Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu	
145 150 155 160	
gaa gat cgt cgt aac tac cca acc aat act tac aaa acg ctt gaa ctt	528
Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu	
165 170 175	
gaa att gct gag ttc gat gtg aaa gtt aaa gaa gcg gag ctt gaa cta	576
Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu	
180 185 190	
gta aaa gag gaa gct aaa gaa ttt cga aac gag ggc aca att aag caa	624
Val Lys Glu Glu Ala Lys Glu Phe Arg Asn Glu Gly Thr Ile Lys Gln	
195 200 205	
gca aaa gag aaa gtt gag agt aaa aaa gct gag gct aca agg tta gaa	672
Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu	
210 215 220	
aac atc aag aca gat cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa	720
Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys	
225 230 235 240	
gca gca gaa gaa gat aaa gtt aaa gaa aaa cca gct gaa caa cca caa	768
Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln	
245 250 255	
cca gcg ccg gct act caa cca gaa aaa cca gct cca aaa cca gag aag	816
Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys	
260 265 270	

cca gct gaa caa cca aaa gca gaa aaa aca gat gat caa caa gct gaa	864
Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu	
275 280 285	
gaa gac tat gct cgt aga tca gaa gaa gaa tat aat cgc ttg act caa	912
Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln	
290 295 300	
cag caa ccg cca aaa act gaa aaa cca gca caa cca tct act cca aaa	960
Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys	
305 310 315 320	
aca ggc tgg aaa caa gaa aac ggt atg tgg tac ttc tac aat act gat	1008
Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp	
325 330 335	
ggt tca atg gca aca gga tgg ctc caa aac aac ggt tca tgg tac tat	1056
Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr	
340 345 350	
cta aac gct aat ggt gct atg gcg aca gga tgg ctc caa aac aat ggt	1104
Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly	
355 360 365	
tca tgg tac tat cta aac gct aat ggt tca atg gca aca gga tgg ctc	1152
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu	
370 375 380	
caa aac aat ggt tca tgg tac tac cta aac gct aat ggt gct atg gcg	1200
Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala	
385 390 395 400	
aca gga tgg ctc caa tac aat ggt tca tgg tac tac cta aac agc aat	1248
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn	
405 410 415	
ggc gct atg gcg aca gga tgg ctc caa tac aat ggc tca tgg tac tac	1296
Gly Ala Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr	
420 425 430	
ctc aac gct aat ggt gat atg gcg aca gga tgg ctc caa aac aac ggt	1344
Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly	
435 440 445	
tca tgg tac tac ctc aac gct aat ggt gat atg gcg aca gga tgg ctc	1392
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu	
450 455 460	
caa tac aac ggt tca tgg tat tac ctc aac gct aat ggt gat atg gcg	1440
Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala	
465 470 475 480	
aca ggt tgg gtg aaa gat gga gat acc tgg tac tat ctt gaa aca tca	1488
Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Thr Ser	
485 490 495	
ggt gct atg aaa gca agc caa tgg ttc aaa gta tca gat aaa tgg tac	1536
Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr	
500 505 510	
tat gtc cat ggc tca agt gcc ctt gca atc aac aca act gta tat ggc	1584

Tyr Val His Gly Ser Ser Ala Leu Ala Ile Asn Thr Thr Val Tyr Gly
515 520 525

tat gga gtc aat gcc aat ggt gaa tgg gta aac taa 1620
Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn
530 535

<210> 54
<211> 539
<212> PRT
<213> Streptococcus pneumoniae

<400> 54
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15

Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly
20 25 30

Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr
35 40 45

Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val
50 55 60

Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg
65 70 75 80

Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile
85 90 95

Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys
100 105 110

Asp Glu Leu Pro Ser Glu Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu
115 120 125

Lys Phe Lys Lys Asp Thr Leu Lys Pro Gly Glu Lys Val Ala Glu Ala
130 135 140

Lys Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu
145 150 155 160

Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu
165 170 175

Glu Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu
180 185 190

Val Lys Glu Glu Ala Lys Glu Phe Arg Asn Glu Gly Thr Ile Lys Gln
195 200 205

Ala Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu
210 215 220

Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys
225 230 235 240

Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln
245 250 255

Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys
 260 265 270
 Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu
 275 280 285
 Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln
 290 295 300
 Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys
 305 310 315 320
 Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp
 325 330 335
 Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr
 340 345 350
 Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly
 355 360 365
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu
 370 375 380
 Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala
 385 390 395 400
 Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn
 405 410 415
 Gly Ala Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr
 420 425 430
 Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly
 435 440 445
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu
 450 455 460
 Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala
 465 470 475 480
 Thr Gly Trp Val Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Thr Ser
 485 490 495
 Gly Ala Met Lys Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr
 500 505 510
 Tyr Val His Gly Ser Ser Ala Leu Ala Ile Asn Thr Thr Val Tyr Gly
 515 520 525
 Tyr Gly Val Asn Ala Asn Gly Glu Trp Val Asn
 530 535

<210> 55
 <211> 1746
 <212> DNA
 <213> Streptococcus pneumoniae

<220>

<221> CDS

<222> (1)..(1743)

<223> additional coding sequence for SpsA

<400> 55

atg	ttt	gca	tca	aaa	agc	gaa	aga	aaa	gta	cat	tat	tca	att	cgt	aaa	48
Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys	
1				5					10					15		

ttt	agt	att	gga	gta	gct	agt	gta	gct	gtt	gcc	agt	ctt	gtt	atg	gga	96
Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Val	Met	Gly	
			20					25					30			

agt	gtg	gtt	cat	gcg	aca	gag	aac	gag	gga	agt	acc	caa	gca	gcc	act	144
Ser	Val	Val	His	Ala	Thr	Glu	Asn	Glu	Gly	Ser	Thr	Gln	Ala	Ala	Thr	
			35				40					45				

tct	tct	aat	atg	gca	aag	aca	gaa	cat	agg	aaa	gct	gct	aaa	caa	gtc	192
Ser	Ser	Asn	Met	Ala	Lys	Thr	Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val	
		50				55					60					

gtc	gat	gaa	tat	ata	gaa	aaa	atg	ttg	agg	gag	att	caa	cta	gat	aga	240
Val	Asp	Glu	Tyr	Ile	Glu	Lys	Met	Leu	Arg	Glu	Ile	Gln	Leu	Asp	Arg	
65					70					75					80	

aga	aaa	cat	acc	caa	aat	gtc	gcc	tta	aac	ata	aag	ttg	agc	gca	att	288
Arg	Lys	His	Thr	Gln	Asn	Val	Ala	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	
				85				90						95		

aaa	acg	aag	tat	ttg	cgt	gaa	tta	aat	gtt	tta	gaa	gag	aag	tcg	aaa	336
Lys	Thr	Lys	Tyr	Leu	Arg	Glu	Leu	Asn	Val	Leu	Glu	Glu	Lys	Ser	Lys	
			100					105					110			

gat	gag	ttg	ccg	tca	gaa	ata	aaa	gca	aag	tta	gac	gca	gct	ttt	gag	384
Asp	Glu	Leu	Pro	Ser	Glu	Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	
		115					120					125				

aag	ttt	aaa	aaa	gat	aca	ttg	aaa	cca	gga	gaa	aag	gta	gca	gaa	gct	432
Lys	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	
	130					135					140					

aag	aag	aag	gtt	gaa	gaa	gct	aag	aaa	aaa	gcc	gag	gat	caa	aaa	gaa	480
Lys	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	
145				150						155					160	

gaa	gat	cgt	cgt	aac	tac	cca	acc	aat	act	tac	aaa	acg	ctt	gaa	ctt	528
Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	
				165					170					175		

gaa	att	gct	gag	ttc	gat	gtg	aaa	gtt	aaa	gaa	gcg	gag	ctt	gaa	cta	576
Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	
		180					185						190			

gta	aaa	gag	gaa	gct	aaa	gaa	tct	cga	aac	gag	ggc	aca	att	aag	caa	624
Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	
		195					200					205				

gca	aaa	gag	aaa	gtt	gag	agt	aaa	aaa	gct	gag	gct	aca	agg	tta	gaa	672
Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	

210	215	220	
aac atc aag aca gat Asn Ile Lys Thr Asp 225	cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys 230 235 240	720	
gca gat gct aag ttg Ala Asp Ala Lys Leu 245	aag gaa gct aat gta gcg act tca gat caa ggt Lys Glu Ala Asn Val Ala Thr Ser Asp Gln Gly 250 255	768	
aaa cca aag ggg cgg Lys Pro Lys Gly Arg 260	gca aaa cga gga gtt cct gga gag cta gca aca Ala Lys Arg Gly Val Pro Gly Glu Leu Ala Thr 265 270	816	
cct gat aaa aaa gaa aat gat gcg aag tct tca gat tct agc gta ggt Pro Asp Lys Lys Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly 275 280 285	864		
gaa gaa act ctt cca agc tca tcc ctg aaa tca gga aaa aag gta gca Glu Glu Thr Leu Pro Ser Ser Ser Leu Lys Ser Gly Lys Lys Val Ala 290 295 300	912		
gaa gct gag aag aag gtt gaa gaa gct gag aaa aaa gcc aag gat caa Glu Ala Glu Lys Lys Val Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln 305 310 315 320	960		
aaa gaa gaa gat cgc cgt aat tac cca acc aat act tac aaa acg ctt Lys Glu Glu Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu 325 330 335	1008		
gac ctt gaa att gct gag tcc gat gtg aaa gtt aaa gaa gcg gag ctt Asp Leu Glu Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu 340 345 350	1056		
gaa cta gta aaa gag gaa gct aag gaa cct cga gac gag gaa aaa att Glu Leu Val Lys Glu Glu Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile 355 360 365	1104		
aag caa gca aaa gcg aaa gtt gag agt aaa aaa gct gag gct aca agg Lys Gln Ala Lys Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg 370 375 380	1152		
tta gaa aac atc aag aca gat cgt aaa aaa gca gaa gaa gaa gct aaa Leu Glu Asn Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys 385 390 395 400	1200		
cga aaa gca gca gaa gaa gat aaa gtt aaa gaa aaa cca gct gaa caa Arg Lys Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln 405 410 415	1248		
cca caa cca gcg ccg gct act caa cca gaa aaa cca gct cca aaa cca Pro Gln Pro Ala Pro Ala Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro 420 425 430	1296		
gag aag cca gct gaa caa cca aaa gca gaa aaa aca gat gat caa caa Glu Lys Pro Ala Glu Gln Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln 435 440 445	1344		
gct gaa gaa gac tat gct cgt aga tca gaa gaa gaa tat aat cgc ttg Ala Glu Glu Asp Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu 450 455 460	1392		

att caa cag caa ccg cca aaa act gaa aaa cca gca caa cca ttt act	1440
Ile Gln Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Phe Thr	
465 470 475 480	
cca aaa aca ggc tgg aaa caa gaa aac ggt atg tgg tac ttc tac aat	1488
Pro Lys Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn	
485 490 495	
act gat ggt tca atg gca aca gga tgg ctc caa tac aac ggt tca tgg	1536
Thr Asp Gly Ser Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp	
500 505 510	
tat tac ctc aac gct aat ggt gat atg gcg aca ggt tgg gtg aaa gat	1584
Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val Lys Asp	
515 520 525	
gga gat acc tgg tac tat ctt gaa gca tca ggt gct atg aaa gca agc	1632
Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys Ala Ser	
530 535 540	
caa tgg ttc aaa gta tca gat aaa tgg tac tat gtc aat ggc tca ggt	1680
Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly	
545 550 555 560	
gcc ctt gca gtc aac aca act gta gat ggc tat gga gtc aat gcc aat	1728
Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn	
565 570 575	
ggt gaa tgg gta aac taa	1746
Gly Glu Trp Val Asn	
580	

<210> 56
 <211> 581
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 56	
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys	
1 5 10 15	
Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Val Met Gly	
20 25 30	
Ser Val Val His Ala Thr Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr	
35 40 45	
Ser Ser Asn Met Ala Lys Thr Glu His Arg Lys Ala Ala Lys Gln Val	
50 55 60	
Val Asp Glu Tyr Ile Glu Lys Met Leu Arg Glu Ile Gln Leu Asp Arg	
65 70 75 80	
Arg Lys His Thr Gln Asn Val Ala Leu Asn Ile Lys Leu Ser Ala Ile	
85 90 95	
Lys Thr Lys Tyr Leu Arg Glu Leu Asn Val Leu Glu Glu Lys Ser Lys	
100 105 110	

Asp	Glu	Leu	Pro	Ser	Glu	Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu		
	115						120				125						
Lys	Phe	Lys	Lys	Asp	Thr	Leu	Lys	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala		
	130					135					140						
Lys	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu		
145				150						155					160		
Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu		
				165					170					175			
Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu		
			180					185					190				
Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln		
	195						200					205					
Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu		
	210					215					220						
Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys		
225					230					235					240		
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly		
				245					250					255			
Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr		
			260					265					270				
Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly		
		275					280					285					
Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala		
	290					295					300						
Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln		
305					310					315					320		
Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu		
				325					330					335			
Asp	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu		
			340					345					350				
Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile		
	355						360					365					
Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg		
	370					375					380						
Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys		
385					390					395					400		
Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln		
				405					410					415			
Pro	Gln	Pro	Ala	Pro	Ala	Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro		
			420					425					430				
Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln		

435		440		445
Ala Glu Glu Asp Tyr	Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu			
450	455	460		
Ile Gln Gln Gln Pro	Pro Lys Thr Glu Lys Pro Ala Gln Pro Phe Thr			
465	470	475		480
Pro Lys Thr Gly Trp	Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn			
	485	490		495
Thr Asp Gly Ser Met	Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp			
	500	505		510
Tyr Tyr Leu Asn Ala	Asn Gly Asp Met Ala Thr Gly Trp Val Lys Asp			
	515	520		525
Gly Asp Thr Trp Tyr	Tyr Leu Glu Ala Ser Gly Ala Met Lys Ala Ser			
	530	535		540
Gln Trp Phe Lys Val	Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser Gly			
	545	550		555
Ala Leu Ala Val Asn	Thr Thr Val Asp Gly Tyr Gly Val Asn Ala Asn			
	565	570		575
Gly Glu Trp Val Asn				
	580			

<210> 57
 <211> 2480
 <212> DNA
 <213> Streptococcus pneumoniae

 <220>
 <221> CDS
 <222> (1)..(1992)
 <223> coding sequence for CbpA

<400> 57	
gaa aac gaa gga agt acc caa gca gcc act tct tct aat atg gca aag	48
Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys	
1 5 10 15	
aca gaa cat agg aaa gct gct aaa caa gtc gtc gat gaa tat ata gaa	96
Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu	
20 25 30	
aaa atg ttg agg gag att caa cta gat aga aga aaa cat acc caa aat	144
Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn	
35 40 45	
gtc gcc tta aac ata aag ttg agc gca att aaa acg aag tat ttg cgt	192
Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg	
50 55 60	
gaa tta aat gtt tta gaa gag aag tcg aaa gat gag ttg ccg tca gaa	240
Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu	

65	70	75	80	
ata aaa gca aag tta gac gca gct ttt gag aag ttt aaa aaa gat aca				288
Ile Lys Ala Lys Leu Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr	85	90	95	
ttg aaa cca gga gaa aag gta gca gaa gct aag aag aag gtt gaa gaa				336
Leu Lys Pro Gly Glu Lys Val Ala Glu Ala Lys Lys Lys Val Glu Glu	100	105	110	
gct aag aaa aaa gcc gag gat caa aaa gaa gaa gat cgt cgt aac tac				384
Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr	115	120	125	
cca acc aat act tac aaa acg ctt gaa ctt gaa att gct gag ttc gat				432
Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Phe Asp	130	135	140	
gtg aaa gtt aaa gaa gcg gag ctt gaa cta gta aaa gag gaa gct aaa				480
Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys	145	150	155	160
gaa tct cga aac gag ggc aca att aag caa gca aaa gag aaa gtt gag				528
Glu Ser Arg Asn Glu Gly Thr Ile Lys Gln Ala Lys Glu Lys Val Glu	165	170	175	
agt aaa aaa gct gag gct aca agg tta gaa aac atc aag aca gat cgt				576
Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg	180	185	190	
aaa aaa gca gaa gaa gaa gct aaa cga aaa gca gat gct aag ttg aag				624
Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys	195	200	205	
gaa gct aat gta gcg act tca gat caa ggt aaa cca aag ggg cgg gca				672
Glu Ala Asn Val Ala Thr Ser Asp Gln Gly Lys Pro Lys Gly Arg Ala	210	215	220	
aaa cga gga gtt cct gga gag cta gca aca cct gat aaa aaa gaa aat				720
Lys Arg Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn	225	230	235	240
gat gcg aag tct tca gat tct agc gta ggt gaa gaa act ctt cca agc				768
Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser	245	250	255	
tca tcc ctg aaa tca gga aaa aag gta gca gaa gct gag aag aag gtt				816
Ser Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Glu Lys Lys Val	260	265	270	
gaa gaa gct gag aaa aaa gcc aag gat caa aaa gaa gaa gat cgc cgt				864
Glu Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg	275	280	285	
aac tac cca acc aat act tac aaa acg ctt gac ctt gaa att gct gag				912
Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ile Ala Glu	290	295	300	
tcc gat gtg aaa gtt aaa gaa gcg gag ctt gaa cta gta aaa gag gaa				960
Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu	305	310	315	320

gct aag gaa cct cga gac gag gaa aaa att aag caa gca aaa gcg aaa	1008
Ala Lys Glu Pro Arg Asp Glu Glu Lys Ile Lys Gln Ala Lys Ala Lys	
325 330 335	
gtt gag agt aaa aaa gct gag gct aca agg tta gaa aac atc aag aca	1056
Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Asn Ile Lys Thr	
340 345 350	
gat cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa gca gca gaa gaa	1104
Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Ala Glu Glu	
355 360 365	
gat aaa gtt aaa gaa aaa cca gct gaa caa cca caa cca gcg ccg gct	1152
Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala	
370 375 380	
act caa cca gaa aaa cca gct cca aaa cca gag aag cca gct gaa caa	1200
Thr Gln Pro Glu Lys Pro Ala Pro Lys Pro Glu Lys Pro Ala Glu Gln	
385 390 395 400	
cca aaa gca gaa aaa aca gat gat caa caa gct gaa gaa gac tat gct	1248
Pro Lys Ala Glu Lys Thr Asp Asp Gln Gln Ala Glu Glu Asp Tyr Ala	
405 410 415	
cgt aga tca gaa gaa gaa tat aat cgc ttg act caa cag caa ccg cca	1296
Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro	
420 425 430	
aaa act gaa aaa cca gca caa cca tct act cca aaa aca ggc tgg aaa	1344
Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr Gly Trp Lys	
435 440 445	
caa gaa aac ggt atg tgg tac ttc tac aat act gat ggt tca atg gca	1392
Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn Thr Asp Gly Ser Met Ala	
450 455 460	
aca gga tgg ctc caa aac aac ggt tca tgg tac tat cta aac gct aat	1440
Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn	
465 470 475 480	
ggt gct atg gcg aca gga tgg ctc caa aac aat ggt tca tgg tac tat	1488
Gly Ala Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr	
485 490 495	
cta aac gct aat ggt tca atg gca aca gga tgg ctc caa aac aat ggt	1536
Leu Asn Ala Asn Gly Ser Met Ala Thr Gly Trp Leu Gln Asn Asn Gly	
500 505 510	
tca tgg tac tac cta aac gct aat ggt gct atg gcg aca gga tgg ctc	1584
Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Ala Met Ala Thr Gly Trp Leu	
515 520 525	
caa tac aat ggt tca tgg tac tac cta aac agc aat ggc gct atg gcg	1632
Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ser Asn Gly Ala Met Ala	
530 535 540	
aca gga tgg ctc caa tac aat ggc tca tgg tac tac ctc aac gct aat	1680
Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu Asn Ala Asn	
545 550 555 560	

ggt gat atg gcg aca gga tgg ctc caa aac aac ggt tca tgg tac tac 1728
 Gly Asp Met Ala Thr Gly Trp Leu Gln Asn Asn Gly Ser Trp Tyr Tyr
 565 570 575

ctc aac gct aat ggt gat atg gcg aca gga tgg ctc caa tac aac ggt 1776
 Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly
 580 585 590

tca tgg tat tac ctc aac gct aat ggt gat atg gcg aca ggt tgg gtg 1824
 Ser Trp Tyr Tyr Leu Asn Ala Asn Gly Asp Met Ala Thr Gly Trp Val
 595 600 605

aaa gat gga gat acc tgg tac tat ctt gaa gca tca ggt gct atg aaa 1872
 Lys Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys
 610 615 620

gca agc caa tgg ttc aaa gta tca gat aaa tgg tac tat gtc aat ggc 1920
 Ala Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly
 625 630 635 640

tca ggt gcc ctt gca gtc aac aca act gta gat ggc tat gga gtc aat 1968
 Ser Gly Ala Leu Ala Val Asn Thr Thr Val Asp Gly Tyr Gly Val Asn
 645 650 655

gcc aat ggt gaa tgg gta aac taa acctaataata actagttaata actgacttcc 2022
 Ala Asn Gly Glu Trp Val Asn
 660

tgtaagaact ttttaaagta ttccctacaa ataccatata ctttcagtag ataataatacc 2082
 cttgtaggaa gtttagatta aaaaataact ctgtaatctc tagccggatt tatagcgcta 2142
 gagactacgg agtttttttg atgaggaaaag aatggcgaggca ttcaagagac tctttaagag 2202
 agttacgggt tttaaactat taagccttct ccaattgcaa gaggcttcaa tctctgctag 2262
 ggtgctagct tgcgaaatgg ctccacggag tttggcagcg ccagatgttc cacggagata 2322
 gtgaggagcg aggccgcgga attcacgaac tgcgacgttt tctcctttga ggtaatacaa 2382
 tcgtttcaag tgttcgtagg cgatcttcat cttgtcttca aagggtcaaata caggtaggat 2442
 ttctcctggt tcaaagttta tgggtggcct ggttgaag 2480

<210> 58
 <211> 663
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 58
 Glu Asn Glu Gly Ser Thr Gln Ala Ala Thr Ser Ser Asn Met Ala Lys
 1 5 10 15
 Thr Glu His Arg Lys Ala Ala Lys Gln Val Val Asp Glu Tyr Ile Glu
 20 25 30
 Lys Met Leu Arg Glu Ile Gln Leu Asp Arg Arg Lys His Thr Gln Asn
 35 40 45
 Val Ala Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr Lys Tyr Leu Arg
 50 55 60
 Glu Leu Asn Val Leu Glu Glu Lys Ser Lys Asp Glu Leu Pro Ser Glu

65					70					75					80
Ile	Lys	Ala	Lys	Leu	Asp	Ala	Ala	Phe	Glu	Lys	Phe	Lys	Lys	Asp	Thr
				85					90					95	
Leu	Lys	Pro	Gly	Glu	Lys	Val	Ala	Glu	Ala	Lys	Lys	Lys	Val	Glu	Glu
			100					105					110		
Ala	Lys	Lys	Lys	Ala	Glu	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
			115				120					125			
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Phe	Asp
			130			135					140				
Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys
				145		150				155					160
Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu
				165				170						175	
Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg
			180					185					190		
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Asp	Ala	Lys	Leu	Lys
			195				200					205			
Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp	Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala
			210			215					220				
Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn
				225		230				235					240
Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser
				245				250						255	
Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val
			260					265					270		
Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg
			275			280						285			
Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Asp	Leu	Glu	Ile	Ala	Glu
			290			295					300				
Ser	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu
				305		310				315					320
Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys
				325				330						335	
Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr
			340					345					350		
Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu
			355			360						365			
Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala
			370			375					380				
Thr	Gln	Pro	Glu	Lys	Pro	Ala	Pro	Lys	Pro	Glu	Lys	Pro	Ala	Glu	Gln
				385		390				395					400
Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp	Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala
				405				410						415	
Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn	Arg	Leu	Thr	Gln	Gln	Gln	Pro	Pro
			420				425						430		
Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro	Ser	Thr	Pro	Lys	Thr	Gly	Trp	Lys
			435			440						445			
Gln	Glu	Asn	Gly	Met	Trp	Tyr	Phe	Tyr	Asn	Thr	Asp	Gly	Ser	Met	Ala
			450			455					460				
Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn
				465		470				475					480
Gly	Ala	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr
				485				490						495	
Leu	Asn	Ala	Asn	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly
			500				505						510		
Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Ala	Met	Ala	Thr	Gly	Trp	Leu
			515			520						525			
Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	Ala	Met	Ala
			530			535					540				
Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn
				545		550				555					560

Gly	Asp	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr		
				565					570					575			
Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly		
			580					585					590				
Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Val		
		595					600						605				
Lys	Asp	Gly	Asp	Thr	Trp	Tyr	Tyr	Leu	Glu	Ala	Ser	Gly	Ala	Met	Lys		
	610					615						620					
Ala	Ser	Gln	Trp	Phe	Lys	Val	Ser	Asp	Lys	Trp	Tyr	Tyr	Val	Asn	Gly		
	625				630					635					640		
Ser	Gly	Ala	Leu	Ala	Val	Asn	Thr	Thr	Val	Asp	Gly	Tyr	Gly	Val	Asn		
				645					650					655			
Ala	Asn	Gly	Glu	Trp	Val	Asn											
			660														

<210> 59
 <211> 3463
 <212> DNA
 <213> Streptococcus pneumoniae

<220>
 <221> CDS
 <222> (319)..(3105)
 <223> coding sequence for PspA

<400> 59
 aagcttatgc ttgtcaataa tcacaaatat gtagatcata tcttgtttag gacagtaaaa 60
 catcctaatt actttttaaa tattttacct gagttgattg gcttgacctt gttgagtcac 120
 gcctatatga cttttgtttt agtttttcca gtttatgcag ttatttttga tgcacgaata 180
 gctgaagagg aaaagttatt acatgaagtt ataatcccaa atggaagcat aaagagataa 240
 atacaaaatt cgatttatat acagttcata ttgaagtgat atagtaaggt taaagaaaaa 300
 atatagaagg aaataaac atg ttt gca tca aaa agc gaa aga aaa gta cat 351
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His
 1 5 10
 tat tca att cgt aaa ttt agt att gga gta gct agt gta gct gtt gcc 399
 Tyr Ser Ile Arg Lys Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala
 15 20 25
 agc ttg ttc tta gga gga gta gtc cat gca gaa ggg gtt aga agt ggg 447
 Ser Leu Phe Leu Gly Gly Val Val His Ala Glu Gly Val Arg Ser Gly
 30 35 40
 aat aac ctc acg gtt aca tct agt ggg caa gat ata tcg aag aag tat 495
 Asn Asn Leu Thr Val Thr Ser Ser Gly Gln Asp Ile Ser Lys Lys Tyr
 45 50 55
 gct gat gaa gtc gag tcg cat cta gaa agt ata ttg aag gat gtc aaa 543
 Ala Asp Glu Val Glu Ser His Leu Glu Ser Ile Leu Lys Asp Val Lys
 60 65 70 75
 aaa aat ttg aaa aaa gtt caa cat acc caa aat gtc ggc tta att aca 591
 Lys Asn Leu Lys Lys Val Gln His Thr Gln Asn Val Gly Leu Ile Thr
 80 85 90

aag ttg agc gaa att aaa aag aag tat ttg tat gac tta aaa gtt aat	639
Lys Leu Ser Glu Ile Lys Lys Lys Tyr Leu Tyr Asp Leu Lys Val Asn	
95 100 105	
gtt tta tcg gaa gct gag ttg acg tca aaa aca aaa gaa aca aaa gaa	687
Val Leu Ser Glu Ala Glu Leu Thr Ser Lys Thr Lys Glu Thr Lys Glu	
110 115 120	
aag tta acc gca act ttt gag cag ttt aaa aaa gat aca tta cca aca	735
Lys Leu Thr Ala Thr Phe Glu Gln Phe Lys Lys Asp Thr Leu Pro Thr	
125 130 135	
gaa cca gaa aaa aag gta gca gaa gct cag aag aag gtt gaa gaa gct	783
Glu Pro Glu Lys Lys Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala	
140 145 150 155	
aag aaa aaa gcc gag gat caa aaa gaa aaa gat cgc cgt aac tac cca	831
Lys Lys Lys Ala Glu Asp Gln Lys Glu Lys Asp Arg Arg Asn Tyr Pro	
160 165 170	
acc att act tac aaa acg ctt gaa ctt gaa att gct gag tcc gat gtg	879
Thr Ile Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val	
175 180 185	
gaa gtt aaa aaa gcg gag ctt gaa cta gta aaa gtg aaa gct aag gaa	927
Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Val Lys Ala Lys Glu	
190 195 200	
tct caa gac gag gaa aaa att aag caa gca gaa gcg gaa gtt gag agt	975
Ser Gln Asp Glu Glu Lys Ile Lys Gln Ala Glu Ala Glu Val Glu Ser	
205 210 215	
aaa caa gct gag gct aca agg tta aaa aaa atc aag aca gat cgt gaa	1023
Lys Gln Ala Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu	
220 225 230 235	
gaa gct aaa cga aaa gca gat gct aag ttg aag gaa gct gtt gaa aag	1071
Glu Ala Lys Arg Lys Ala Asp Ala Lys Leu Lys Glu Ala Val Glu Lys	
240 245 250	
aat gta gcg act tca gag caa gat aaa cca aag agg cgg gca aaa cga	1119
Asn Val Ala Thr Ser Glu Gln Asp Lys Pro Lys Arg Arg Ala Lys Arg	
255 260 265	
gga gtt tct gga gag cta gca aca cct gat aaa aaa gaa aat gat gcg	1167
Gly Val Ser Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala	
270 275 280	
aag tct tca gat tct agc gta ggt gaa gaa act ctt cca agc cca tcc	1215
Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser	
285 290 295	
ctt aat atg gca aat gaa agt cag aca gaa cat agg aaa gat gtc gat	1263
Leu Asn Met Ala Asn Glu Ser Gln Thr Glu His Arg Lys Asp Val Asp	
300 305 310 315	
gaa tat ata aaa aaa atg ttg agt gag atc caa tta gat aga aga aaa	1311
Glu Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln Leu Asp Arg Arg Lys	
320 325 330	

cat acc caa aat gtc aac tta aac ata aag ttg agc gca att aaa acg	1359
His Thr Gln Asn Val Asn Leu Asn Ile Lys Leu Ser Ala Ile Lys Thr	
335 340 345	
aag tat ttg tat gaa tta agt gtt tta aaa gag aac tcg aaa aaa gaa	1407
Lys Tyr Leu Tyr Glu Leu Ser Val Leu Lys Glu Asn Ser Lys Lys Glu	
350 355 360	
gag ttg acg tca aaa acc aaa gca gag tta acc gca gct ttt gag cag	1455
Glu Leu Thr Ser Lys Thr Lys Ala Glu Leu Thr Ala Ala Phe Glu Gln	
365 370 375	
ttt aaa aaa gat aca ttg aaa cca gaa aaa aag gta gca gaa gct gag	1503
Phe Lys Lys Asp Thr Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu	
380 385 390 395	
aag aag gtt gaa gaa gct aag aaa aaa gcc aag gat caa aaa gaa gaa	1551
Lys Lys Val Glu Glu Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu	
400 405 410	
gat cgc cgt aac tac cca acc aat act tac aaa acg ctt gaa ctt gaa	1599
Asp Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu	
415 420 425	
att gct gag tcc gat gtg aaa gtt aaa gaa gcg gag ctt gaa cta gta	1647
Ile Ala Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val	
430 435 440	
aaa gag gaa gct aac gaa tct cga aac gag gaa aaa att aag caa gca	1695
Lys Glu Glu Ala Asn Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala	
445 450 455	
aaa gag aaa gtt gag agt aaa aaa gct gag gct aca agg tta gaa aaa	1743
Lys Glu Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys	
460 465 470 475	
atc aag aca gat cgt aaa aaa gca gaa gaa gaa gct aaa cga aaa gca	1791
Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala	
480 485 490	
gaa gaa tct gag aaa aaa gct gct gaa gcc aaa caa aaa gtg gat gct	1839
Glu Glu Ser Glu Lys Lys Ala Ala Glu Ala Lys Gln Lys Val Asp Ala	
495 500 505	
gaa gaa tat gct ctt gaa gct aaa atc gct gag ttg gaa tat gaa gtt	1887
Glu Glu Tyr Ala Leu Glu Ala Lys Ile Ala Glu Leu Glu Tyr Glu Val	
510 515 520	
cag aga cta gaa aaa gag ctc aaa gag att gat gag tct gac tca gaa	1935
Gln Arg Leu Glu Lys Glu Leu Lys Glu Ile Asp Glu Ser Asp Ser Glu	
525 530 535	
gat tat ctt aaa gaa ggc ctc cgt gct cct ctt caa tct aaa ttg gat	1983
Asp Tyr Leu Lys Glu Gly Leu Arg Ala Pro Leu Gln Ser Lys Leu Asp	
540 545 550 555	
acc aaa aaa gct aaa cta tca aaa ctt gaa gag ttg agt gat aag att	2031
Thr Lys Lys Ala Lys Leu Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile	
560 565 570	
gat gag tta gac gct gaa att gca aaa ctt gaa gtt caa ctt aaa gat	2079

Asp	Glu	Leu	Asp	Ala	Glu	Ile	Ala	Lys	Leu	Glu	Val	Gln	Leu	Lys	Asp	
			575					580					585			
gct	gaa	gga	aac	aat	aat	gta	gaa	gcc	tac	ttt	aaa	gaa	ggt	tta	gag	2127
Ala	Glu	Gly	Asn	Asn	Asn	Val	Glu	Ala	Tyr	Phe	Lys	Glu	Gly	Leu	Glu	
		590					595					600				
aaa	act	act	gct	gag	aaa	aaa	gct	gaa	tta	gaa	aaa	gct	gaa	gct	gac	2175
Lys	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu	Leu	Glu	Lys	Ala	Glu	Ala	Asp	
	605					610					615					
ctt	aag	aaa	gca	gtt	gat	gag	cca	gaa	act	cca	gct	ccg	gct	cct	caa	2223
Leu	Lys	Lys	Ala	Val	Asp	Glu	Pro	Glu	Thr	Pro	Ala	Pro	Ala	Pro	Gln	
620					625					630					635	
cca	gct	cca	gct	cca	gaa	aaa	cca	gct	gaa	aaa	cca	gct	cca	gct	cca	2271
Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	
				640					645					650		
gaa	aaa	cca	gct	cca	gct	cca	gaa	aaa	cca	gct	cca	gct	cca	gaa	aaa	2319
Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	
			655					660					665			
cca	gct	cca	gct	cca	gaa	aaa	cca	gct	cca	gct	cca	gaa	aaa	cca	gct	2367
Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	
			670				675					680				
cca	act	cca	gaa	act	cca	aaa	aca	ggc	tgg	aaa	caa	gaa	aac	ggt	atg	2415
Pro	Thr	Pro	Glu	Thr	Pro	Lys	Thr	Gly	Trp	Lys	Gln	Glu	Asn	Gly	Met	
	685					690					695					
tgg	tac	ttc	tac	aat	act	gat	ggt	tca	atg	gca	aca	ggc	tgg	ctc	caa	2463
Trp	Tyr	Phe	Tyr	Asn	Thr	Asp	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	Gln	
700					705					710					715	
aac	aat	ggc	tca	tgg	tac	tac	ctc	aac	agc	aat	ggc	gct	atg	gcg	aca	2511
Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	Ala	Met	Ala	Thr	
				720					725					730		
gga	tgg	ctc	caa	aac	aat	ggc	tca	tgg	tac	tac	ctc	aac	agc	aat	ggc	2559
Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	
			735					740					745			
gct	atg	gcg	aca	gga	tgg	ctc	caa	tac	aat	ggt	tca	tgg	tac	tac	ctc	2607
Ala	Met	Ala	Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	
		750					755					760				
aac	gct	aat	ggt	gat	atg	gcg	aca	gga	tgg	ctc	caa	tac	aat	ggt	tca	2655
Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	
	765					770					775					
tgg	tac	tac	ctc	aac	gct	aat	ggt	gat	atg	gcg	aca	gga	tgg	ttc	caa	2703
Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met		Ala	Thr	Gly	Trp	Phe	
780					785					790					Gln	
															795	
tac	aat	ggt	tca	tgg	tac	tac	ctc	aac	gct	aat	ggt	gat	atg	gcg	aca	2751
Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	
				800					805					810		
gga	tgg	ttc	caa	tac	aat	ggt	tca	tgg	tac	tac	ctc	aac	gct	aat	ggt	2799
Gly	Trp	Phe	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	

815	820	825	
gat atg gcg aca gga tgg ctc caa tac aat ggt tca tgg tac tac cta			2847
Asp Met Ala Thr Gly Trp Leu Gln Tyr Asn Gly Ser Trp Tyr Tyr Leu			
830	835	840	
aac agc aat ggt gct atg gta aca gga tgg ctc caa aac aat ggc tca			2895
Asn Ser Asn Gly Ala Met Val Thr Gly Trp Leu Gln Asn Asn Gly Ser			
845	850	855	
tgg tac tac cta aac gct aac ggt tca atg gca aca gat tgg gtg aaa			2943
Trp Tyr Tyr Leu Asn Ala Asn Gly Ser Met Ala Thr Asp Trp Val Lys			
860	865	870	875
gat gga gat acc tgg tac tat ctt gaa gca tca ggt gct atg aaa gca			2991
Asp Gly Asp Thr Trp Tyr Tyr Leu Glu Ala Ser Gly Ala Met Lys Ala			
880	885	890	
agc caa tgg ttc aaa gta tca gat aaa tgg tac tat gtc aat ggc tca			3039
Ser Gln Trp Phe Lys Val Ser Asp Lys Trp Tyr Tyr Val Asn Gly Ser			
895	900	905	
ggt gcc ctt gca gtc aac aca act gta gat agc tat aga gtc aat gcc			3087
Gly Ala Leu Ala Val Asn Thr Thr Val Asp Ser Tyr Arg Val Asn Ala			
910	915	920	
aat ggt gaa tgg gta aac taaacttaat ataactagtt aatactgact			3135
Asn Gly Glu Trp Val Asn			
925			
tcctgtaaga actctttaaa gtattcccta caaataccat atcctttcag tagataatat			3195
acccttgtag gaagtttaga ttaaaaaata actctgtaat ctctagccgg atttatagcg			3255
ctagagacta cggagttttt ttgatgagga aagaatggcg gcattcaaga gactcttta			3315
gagagttacg ggttttaaac tattaagctt tctccaattg caagagggct tcaatctctg			3375
ctaggtgcta gcttgcgaaa tggctccac ggagtttggc rgcgccagat gttccacgga			3435
ggtagtgagg agcgaggccg cggaattc			3463

<210> 60

<211> 929

<212> PRT

<213> Streptococcus pneumoniae

<400> 60

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
1				5					10					15	

Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Phe	Leu	Gly
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

20

25

30

Gly	Val	Val	His	Ala	Glu	Gly	Val	Arg	Ser	Gly	Asn	Asn	Leu	Thr	Val
	35						40					45			

Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser	Lys	Lys	Tyr	Ala	Asp	Glu	Val	Glu
	50					55					60				

Ser	His	Leu	Glu	Ser	Ile	Leu	Lys	Asp	Val	Lys	Lys	Asn	Leu	Lys	Lys	
65					70					75					80	
Val	Gln	His	Thr	Gln	Asn	Val	Gly	Leu	Ile	Thr	Lys	Leu	Ser	Glu	Ile	
				85					90					95		
Lys	Lys	Lys	Tyr	Leu	Tyr	Asp	Leu	Lys	Val	Asn	Val	Leu	Ser	Glu	Ala	
			100				105						110			
Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr	Lys	Glu	Lys	Leu	Thr	Ala	Thr	
		115					120					125				
Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Glu	Lys	Lys	
130						135					140					
Val	Ala	Glu	Ala	Gln	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu	
145					150					155					160	
Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys	
				165					170					175		
Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala	
			180					185					190			
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu	
		195					200					205				
Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala	
	210					215					220					
Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys	
225					230					235					240	
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser	
				245					250					255		
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu	
			260					265					270			
Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	
		275					280					285				
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn	
	290					295					300					
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys	
305					310					315					320	
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val	
				325					330					335		
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu	
			340					345					350			
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys	
		355					360					365				
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	
	370					375					380					

Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 385 390 395 400
 Ala Lys Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 405 410 415
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp
 420 425 430
 Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Asn
 435 440 445
 Glu Ser Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys Glu Lys Val Glu
 450 455 460
 Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys Thr Asp Arg
 465 470 475 480
 Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys Ala Glu Glu Ser Glu Lys
 485 490 495
 Lys Ala Ala Glu Ala Lys Gln Lys Val Asp Ala Glu Glu Tyr Ala Leu
 500 505 510
 Glu Ala Lys Ile Ala Glu Leu Glu Tyr Glu Val Gln Arg Leu Glu Lys
 515 520 525
 Glu Leu Lys Glu Ile Asp Glu Ser Asp Ser Glu Asp Tyr Leu Lys Glu
 530 535 540
 Gly Leu Arg Ala Pro Leu Gln Ser Lys Leu Asp Thr Lys Lys Ala Lys
 545 550 555 560
 Leu Ser Lys Leu Glu Glu Leu Ser Asp Lys Ile Asp Glu Leu Asp Ala
 565 570 575
 Glu Ile Ala Lys Leu Glu Val Gln Leu Lys Asp Ala Glu Gly Asn Asn
 580 585 590
 Asn Val Glu Ala Tyr Phe Lys Glu Gly Leu Glu Lys Thr Thr Ala Glu
 595 600 605
 Lys Lys Ala Glu Leu Glu Lys Ala Glu Ala Asp Leu Lys Lys Ala Val
 610 615 620
 Asp Glu Pro Glu Thr Pro Ala Pro Ala Pro Gln Pro Ala Pro Ala Pro
 625 630 635 640
 Glu Lys Pro Ala Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro
 645 650 655
 Ala Pro Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Ala Pro
 660 665 670
 Glu Lys Pro Ala Pro Ala Pro Glu Lys Pro Ala Pro Thr Pro Glu Thr
 675 680 685
 Pro Lys Thr Gly Trp Lys Gln Glu Asn Gly Met Trp Tyr Phe Tyr Asn
 690 695 700

Thr	Asp	Gly	Ser	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	705	710	715	720
Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	Ala	Met	Ala	Thr	Gly	Trp	Leu	Gln	Asn	725	730	735	
Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	Ala	Met	Ala	Thr	Gly	740	745	750	
Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	755	760	765	
Met	Ala	Thr	Gly	Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	770	775	780	
Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Phe	Gln	Tyr	Asn	Gly	Ser	Trp	785	790	795	800
Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	Trp	Phe	Gln	Tyr	805	810	815	
Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ala	Asn	Gly	Asp	Met	Ala	Thr	Gly	820	825	830	
Trp	Leu	Gln	Tyr	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	Ser	Asn	Gly	Ala	835	840	845	
Met	Val	Thr	Gly	Trp	Leu	Gln	Asn	Asn	Gly	Ser	Trp	Tyr	Tyr	Leu	Asn	850	855	860	
Ala	Asn	Gly	Ser	Met	Ala	Thr	Asp	Trp	Val	Lys	Asp	Gly	Asp	Thr	Trp	865	870	875	880
Tyr	Tyr	Leu	Glu	Ala	Ser	Gly	Ala	Met	Lys	Ala	Ser	Gln	Trp	Phe	Lys	885	890	895	
Val	Ser	Asp	Lys	Trp	Tyr	Tyr	Val	Asn	Gly	Ser	Gly	Ala	Leu	Ala	Val	900	905	910	
Asn	Thr	Thr	Val	Asp	Ser	Tyr	Arg	Val	Asn	Ala	Asn	Gly	Glu	Trp	Val	915	920	925	

Asn

<210> 61
 <211> 690
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 61
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
 20 25 30
 Gly Val Val His Ala Glu Gly Val Arg Ser Gly Asn Asn Leu Thr Val
 35 40 45

Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser	Lys	Lys	Tyr	Ala	Asp	Glu	Val	Glu		
	50					55					60						
Ser	His	Leu	Glu	Ser	Ile	Leu	Lys	Asp	Val	Lys	Lys	Asn	Leu	Lys	Lys		
65					70					75					80		
Val	Gln	His	Thr	Gln	Asn	Val	Gly	Leu	Ile	Thr	Lys	Leu	Ser	Glu	Ile		
				85					90					95			
Lys	Lys	Lys	Tyr	Leu	Tyr	Asp	Leu	Lys	Val	Asn	Val	Leu	Ser	Glu	Ala		
			100					105					110				
Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr	Lys	Glu	Lys	Leu	Thr	Ala	Thr		
		115					120					125					
Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Glu	Lys	Lys		
130						135					140						
Val	Ala	Glu	Ala	Gln	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu		
145					150					155					160		
Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys		
				165					170					175			
Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala		
			180					185					190				
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu		
		195					200					205					
Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala		
	210					215					220						
Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys		
225					230					235					240		
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser		
				245					250					255			
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu		
			260					265					270				
Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser		
		275					280					285					
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn		
	290					295					300						
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys		
305					310					315					320		
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val		
				325					330					335			
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu		
			340					345					350				
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys		
		355					360					365					

<210> 62

<211> 701

<212> PRT

<213> Streptococcus pneumoniae

<400> 62

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
1				5					10					15	
Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Phe	Leu	Gly
			20					25					30		
Gly	Val	Val	His	Ala	Glu	Gly	Val	Arg	Ser	Gly	Asn	Asn	Leu	Thr	Val
		35					40					45			
Thr	Ser	Ser	Gly	Gln	Asp	Ile	Ser	Lys	Lys	Tyr	Ala	Asp	Glu	Val	Glu
	50					55					60				
Ser	His	Leu	Glu	Ser	Ile	Leu	Lys	Asp	Val	Lys	Lys	Asn	Leu	Lys	Lys
65					70					75					80
Val	Gln	His	Thr	Gln	Asn	Val	Gly	Leu	Ile	Thr	Lys	Leu	Ser	Glu	Ile
				85					90					95	
Lys	Lys	Lys	Tyr	Leu	Tyr	Asp	Leu	Lys	Val	Asn	Val	Leu	Ser	Glu	Ala
			100					105					110		
Glu	Leu	Thr	Ser	Lys	Thr	Lys	Glu	Thr	Lys	Glu	Lys	Leu	Thr	Ala	Thr
		115					120					125			
Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr	Leu	Pro	Thr	Glu	Pro	Glu	Lys	Lys
	130					135					140				
Val	Ala	Glu	Ala	Gln	Lys	Lys	Val	Glu	Glu	Ala	Lys	Lys	Lys	Ala	Glu
145					150					155					160
Asp	Gln	Lys	Glu	Lys	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Ile	Thr	Tyr	Lys
				165					170					175	
Thr	Leu	Glu	Leu	Glu	Ile	Ala	Glu	Ser	Asp	Val	Glu	Val	Lys	Lys	Ala
				180					185					190	
Glu	Leu	Glu	Leu	Val	Lys	Val	Lys	Ala	Lys	Glu	Ser	Gln	Asp	Glu	Glu
		195					200					205			
Lys	Ile	Lys	Gln	Ala	Glu	Ala	Glu	Val	Glu	Ser	Lys	Gln	Ala	Glu	Ala
	210					215					220				
Thr	Arg	Leu	Lys	Lys	Ile	Lys	Thr	Asp	Arg	Glu	Glu	Ala	Lys	Arg	Lys
225					230					235					240
Ala	Asp	Ala	Lys	Leu	Lys	Glu	Ala	Val	Glu	Lys	Asn	Val	Ala	Thr	Ser
				245					250					255	
Glu	Gln	Asp	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu
			260					265					270		

Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser		
		275					280					285					
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn		
	290					295					300						
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys		
305					310					315					320		
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val		
				325					330					335			
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu		
			340					345					350				
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys		
		355					360					365					
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr		
	370					375					380						
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu		
385					390					395				400			
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr		
				405					410					415			
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val		
			420					425					430				
Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu		
	435						440					445					
Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser		
	450					455					460						
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Arg	Lys		
465					470					475					480		
Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys	Lys		
				485					490					495			
Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu	Glu		
			500					505					510				
Ala	Lys	Ile	Ala	Glu	Leu	Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys	Glu		
		515					520					525					
Leu	Lys	Glu	Ile	Asp	Glu	Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu	Gly		
	530					535					540						
Leu	Arg	Ala	Pro	Leu	Gln	Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys	Leu		
545					550					555					560		
Ser	Lys	Leu	Glu	Glu	Leu	Ser	Asp	Lys	Ile	Asp	Glu	Leu	Asp	Ala	Glu		
				565					570					575			
Ile	Ala	Lys	Leu	Glu	Val	Gln	Leu	Lys	Asp	Ala	Glu	Gly	Asn	Asn	Asn		
			580					585					590				
Val	Glu	Ala	Tyr	Phe	Lys	Glu	Gly	Leu	Glu	Lys	Thr	Thr	Ala	Glu	Lys		

595		600		605											
Lys	Ala	Glu	Leu	Glu	Lys	Ala	Glu	Ala	Asp	Leu	Lys	Lys	Ala	Val	Asp
610					615						620				
Glu	Pro	Glu	Thr	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Glu
625					630					635					640
Lys	Pro	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala
				645					650					655	
Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala
			660					665					670		
Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu
		675					680				685				
Lys	Pro	Ala	Pro	Ala	Pro	Lys	Pro	Glu	Thr	Pro	Glu	Thr			
690						695					700				

<210> 63
 <211> 670
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 63
Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
1 5 10 15
Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
20 25 30
Ser Val Val His Ala Thr Glu Asn Glu Gly Ile Thr Gln Val Ala Thr
35 40 45
Ser Tyr Asn Lys Ala Asn Glu Ser Gln Thr Glu His Arg Lys Ala Ala
50 55 60
Lys Gln Val Asp Glu Asp Ile Lys Lys Met Leu Ser Glu Ile Gln Glu
65 70 75 80
Tyr Ile Lys Lys Met Leu Ser Glu Ile Gln Leu Asp Lys Arg Lys His
85 90 95
Thr Gln Asn Val Asn Leu Asn Arg Lys Leu Ser Ala Ile Gln Thr Lys
100 105 110
Tyr Leu Tyr Glu Leu Arg Val Leu Lys Glu Lys Ser Lys Lys Glu Glu
115 120 125
Leu Thr Ser Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu
130 135 140
Ile Ala Glu Phe Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val
145 150 155 160
Lys Glu Glu Ala Lys Pro Arg Asn Glu Glu Lys Ile Lys Gln Ala Lys
165 170 175
Ala Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Glu Ile

180					185					190					
Lys	Thr	Glu	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu
		195					200					205			
Glu	Ser	Glu	Lys	Lys	Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Thr	Lys
		210					215					220			
Glu	Gln	Gly	Lys	Pro	Lys	Arg	Arg	Ala	Lys	Arg	Gly	Val	Ser	Gly	Glu
		225					230					235			240
Leu	Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser
				245					250					255	
Ser	Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Pro	Ser	Leu	Asn	Met	Ala	Asn
			260					265					270		
Glu	Ser	Gln	Thr	Glu	His	Arg	Lys	Asp	Val	Asp	Glu	Tyr	Ile	Lys	Lys
		275					280					285			
Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg	Arg	Lys	His	Thr	Gln	Asn	Val
		290					295					300			
Asn	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile	Lys	Thr	Lys	Tyr	Leu	Tyr	Glu
		305					310					315			320
Leu	Ser	Val	Leu	Lys	Glu	Asn	Ser	Lys	Lys	Glu	Glu	Leu	Thr	Ser	Lys
				325					330					335	
Thr	Lys	Ala	Glu	Leu	Thr	Ala	Ala	Phe	Glu	Gln	Phe	Lys	Lys	Asp	Thr
			340					345					350		
Leu	Lys	Pro	Glu	Lys	Lys	Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu
		355					360					365			
Ala	Lys	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr
		370					375					380			
Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val
		385					390					395			400
Lys	Val	Asp	Lys	Ala	Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Asn	Glu
				405					410					415	
Ser	Arg	Asn	Glu	Glu	Lys	Ile	Lys	Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser
			420					425					430		
Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu	Glu	Lys	Ile	Lys	Thr	Asp	Asp	Arg
		435					440					445			
Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys	Arg	Lys	Ala	Glu	Glu	Ser	Glu	Lys
		450					455					460			
Lys	Ala	Ala	Glu	Ala	Lys	Gln	Lys	Val	Asp	Ala	Glu	Glu	Tyr	Ala	Leu
		465					470					475			480
Glu	Ala	Lys	Ile	Ala	Glu	Leu	Glu	Tyr	Glu	Val	Gln	Arg	Leu	Glu	Lys
				485					490					495	
Glu	Leu	Lys	Glu	Ile	Asp	Glu	Ser	Asp	Ser	Glu	Asp	Tyr	Leu	Lys	Glu

500					505					510					
Gly	Leu	Arg	Ala	Pro	Leu	Gln	Ser	Lys	Leu	Asp	Thr	Lys	Lys	Ala	Lys
		515					520					525			
Leu	Ser	Lys	Leu	Glu	Glu	Leu	Ser	Asp	Lys	Ile	Asp	Glu	Leu	Asp	Ala
		530					535					540			
Glu	Ile	Ala	Lys	Leu	Glu	Val	Gln	Leu	Lys	Asp	Ala	Glu	Gly	Asn	Asn
															560
Asn	Val	Glu	Ala	Tyr	Phe	Lys	Glu	Gly	Leu	Glu	Lys	Thr	Thr	Ala	Glu
				565					570						575
Lys	Lys	Ala	Glu	Leu	Glu	Lys	Ala	Glu	Ala	Asp	Leu	Lys	Lys	Ala	Val
			580					585					590		
Asp	Glu	Pro	Glu	Thr	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Ala	Pro	Ala	Pro
			595					600					605		
Glu	Lys	Pro	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro
			610					615					620		
Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Glu	Lys	Pro	Ala	Glu	Lys	Pro	Ala
															640
Glu	Glu	Pro	Ala	Glu	Lys	Pro	Ala	Pro	Ala	Pro	Glu	Lys	Pro	Ala	Pro
				645					650						655
Thr	Pro	Glu	Lys	Pro	Ala	Pro	Thr	Pro	Glu	Thr	Pro	Lys	Thr		
			660					665					670		

<210> 64

<211> 437

<212> PRT

<213> Streptococcus pneumoniae

<400> 64

Met	Phe	Ala	Ser	Lys	Ser	Glu	Arg	Lys	Val	His	Tyr	Ser	Ile	Arg	Lys
1				5					10					15	
Phe	Ser	Ile	Gly	Val	Ala	Ser	Val	Ala	Val	Ala	Ser	Leu	Val	Met	Gly
			20					25					30		
Ser	Val	Val	His	Ala	Thr	Glu	Asn	Glu	Gly	Ser	Thr	Gln	Ala	Ala	Thr
			35				40					45			
Ser	Ser	Asn	Met	Ala	Lys	Thr	Glu	His	Arg	Lys	Ala	Ala	Lys	Gln	Val
			50			55					60				
Val	Asp	Glu	Tyr	Ile	Glu	Lys	Met	Leu	Ser	Glu	Ile	Gln	Leu	Asp	Arg
					70					75					80
Arg	Lys	His	Thr	Gln	Asn	Val	Ala	Leu	Asn	Ile	Lys	Leu	Ser	Ala	Ile
				85					90					95	
Lys	Thr	Lys	Tyr	Leu	Arg	Glu	Leu	Asn	Val	Leu	Glu	Glu	Lys	Ser	Lys
			100					105					110		
Asp	Glu	Leu	Pro	Ser	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Leu	Glu

115					120					125					
Leu	Glu	Ile	Ala	Glu	Phe	Asp	Val	Lys	Val	Lys	Glu	Ala	Glu	Leu	Glu
130					135					140					
Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Ser	Arg	Asn	Glu	Gly	Thr	Ile	Lys
145					150					155					160
Gln	Ala	Lys	Glu	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala	Thr	Arg	Leu
				165					170					175	
Glu	Asn	Glu	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu	Ala	Lys
			180					185					190		
Arg	Lys	Ala	Asp	Gly	Lys	Leu	Lys	Glu	Ala	Asn	Val	Ala	Thr	Ser	Asp
		195					200					205			
Gln	Gly	Lys	Pro	Lys	Gly	Arg	Ala	Lys	Arg	Gly	Val	Pro	Gly	Glu	Leu
210					215					220					
Ala	Thr	Pro	Asp	Lys	Lys	Glu	Asn	Asp	Ala	Lys	Ser	Ser	Asp	Ser	Ser
225					230					235					240
Val	Gly	Glu	Glu	Thr	Leu	Pro	Ser	Ser	Ser	Leu	Lys	Ser	Gly	Lys	Lys
				245					250					255	
Val	Ala	Glu	Ala	Glu	Lys	Lys	Val	Glu	Glu	Ala	Glu	Lys	Lys	Ala	Lys
			260					265					270		
Asp	Gln	Lys	Glu	Glu	Asp	Arg	Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys
		275					280					285			
Thr	Leu	Asp	Glu	Leu	Glu	Ala	Glu	Ser	Asp	Val	Lys	Val	Lys	Glu	Ala
	290					295					300				
Glu	Leu	Glu	Leu	Val	Lys	Glu	Glu	Ala	Lys	Glu	Pro	Arg	Asp	Glu	Glu
305					310					315					320
Lys	Ile	Lys	Gln	Ala	Lys	Ala	Lys	Val	Glu	Ser	Lys	Lys	Ala	Glu	Ala
			325						330					335	
Thr	Arg	Leu	Glu	Asn	Ile	Lys	Thr	Asp	Arg	Lys	Lys	Ala	Glu	Glu	Glu
		340					345						350		
Ala	Lys	Arg	Lys	Ala	Ala	Glu	Glu	Asp	Lys	Val	Lys	Glu	Lys	Pro	Ala
		355					360					365			
Glu	Gln	Pro	Gln	Pro	Ala	Pro	Ala	Pro	Gln	Pro	Glu	Lys	Pro	Ala	Pro
	370					375					380				
Lys	Pro	Glu	Lys	Pro	Ala	Glu	Gln	Pro	Lys	Ala	Glu	Lys	Thr	Asp	Asp
385					390					395					400
Gln	Gln	Ala	Glu	Glu	Asp	Tyr	Ala	Arg	Arg	Ser	Glu	Glu	Glu	Tyr	Asn
			405					410						415	
Arg	Leu	Thr	Gln	Gln	Gln	Pro	Pro	Lys	Thr	Glu	Lys	Pro	Ala	Gln	Pro
			420					425					430		
Ser	Thr	Pro	Lys	Thr											
		435													

<210> 65
 <211> 478
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 65
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Leu Gly
 20 25 30
 Gly Val Val His Ala Glu Gly Val Arg Ser Glu Asn Thr Pro Val Thr
 35 40 45
 Ser Ser Gly Asp Glu Val Asp Glu Tyr Ile Lys Lys Met Leu Ser Glu
 50 55 60
 Ile Gln Leu Asp Lys Arg Lys His Thr His Asn Phe Ala Leu Asn Leu
 65 70 75 80
 Lys Leu Ser Arg Ile Lys Thr Glu Tyr Leu Tyr Lys Leu Lys Val Asn
 85 90 95
 Val Leu Glu Glu Lys Ser Lys Ala Glu Leu Thr Ser Lys Thr Lys Lys
 100 105 110
 Glu Val Asp Ala Ala Phe Glu Lys Phe Lys Lys Asp Thr Leu Lys Leu
 115 120 125
 Gly Glu Lys Val Ala Glu Ala Gln Lys Lys Val Glu Glu Ala Lys Lys
 130 135 140
 Lys Ala Lys Asp Gln Lys Glu Glu Asp His Arg Asn Tyr Pro Thr Asn
 145 150 155 160
 Thr Tyr Lys Thr Leu Glu Leu Glu Ile Ala Glu Ser Asp Val Lys Val
 165 170 175
 Lys Glu Ala Glu Leu Glu Leu Leu Lys Glu Glu Ala Lys Thr Arg Asn
 180 185 190
 Glu Asp Thr Ile Asn Gln Ala Lys Ala Lys Val Lys Ser Glu Gln Ala
 195 200 205
 Glu Ala Thr Arg Leu Lys Lys Ile Lys Thr Asp Arg Glu Gln Ala Glu
 210 215 220
 Ala Thr Arg Leu Glu Asn Ile Lys Thr Asp Arg Glu Lys Ala Glu Glu
 225 230 235 240
 Ala Lys Arg Lys Ala Glu Ala Glu Glu Val Lys Asp Lys Leu Lys Arg
 245 250 255
 Arg Thr Lys Arg Ala Val Pro Gly Glu Pro Ala Thr Pro Asp Lys Lys
 260 265 270
 Glu Asn Asp Ala Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu
 275 280 285

Pro Ser Pro Ser Leu Lys Ser Gly Lys Lys Val Ala Glu Ala Gln Lys
 290 295 300
 Lys Val Ala Glu Ala Glu Lys Lys Ala Lys Asp Gln Lys Glu Glu Asp
 305 310 315 320
 Arg Arg Asn Tyr Pro Thr Asn Thr Tyr Lys Thr Leu Asp Leu Glu Ala
 325 330 335
 Glu Ser Asp Val Lys Val Lys Glu Ala Glu Leu Glu Leu Val Lys Glu
 340 345 350
 Glu Ala Lys Glu Ser Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala
 355 360 365
 Lys Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu Lys Ile Lys
 370 375 380
 Thr Asp Arg Lys Lys Ala Glu Glu Ala Lys Arg Arg Ala Ala Glu Glu
 385 390 395 400
 Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Glu Lys Pro Thr Glu
 405 410 415
 Glu Pro Glu Asn Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu
 420 425 430
 Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr
 435 440 445
 Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro
 450 455 460
 Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr Pro Lys Thr
 465 470 475

<210> 66
 <211> 487
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 66
 Met Phe Ala Ser Lys Asn Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Ala Val Ala Ser Leu Phe Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Lys Glu Val Thr Thr Gln Val Ala Thr
 35 40 45
 Ser Phe Asn Lys Ala Asn Lys Ser Gln Thr Glu His Met Lys Ala Ala
 50 55 60
 Lys Gln Val Asp Glu Tyr Ile Thr Lys Lys Leu Gln Leu Asp Arg Arg
 65 70 75 80
 Lys His Thr Gln Asn Val Gly Leu Leu Thr Lys Leu Gly Val Ile Lys

			85					90					95				
Thr	Glu	Tyr	Leu 100	His	Arg	Leu	Ser	Val 105	Ser	Lys	Glu	Lys	Ser 110	Glu	Ala		
Glu	Leu	Pro 115	Ser	Glu	Ile	Lys	Ala 120	Lys	Leu	Asp	Ala	Ala 125	Phe	Glu	Gln		
Phe	Lys 130	Lys	Asp	Thr	Leu	Pro 135	Thr	Glu	Pro	Gly	Lys 140	Lys	Val	Ala	Glu		
Ala 145	Glu	Lys	Lys	Val	Glu 150	Glu	Ala	Lys	Lys	Lys 155	Ala	Glu	Asp	Gln	Lys 160		
Glu	Glu	Asp	Arg	Arg 165	Asn	Tyr	Pro	Thr	Ile 170	Thr	Tyr	Lys	Thr	Leu 175	Glu		
Leu	Glu	Ile	Ala 180	Glu	Ser	Asp	Val	Glu 185	Val	Lys	Lys	Ala	Glu 190	Leu	Glu		
Leu	Val	Lys 195	Glu	Glu	Ala	Lys	Gly 200	Ser	Arg	Asn	Glu	Gln 205	Lys	Val	Asn		
Gln	Ala 210	Lys	Ala	Lys	Val	Glu 215	Ser	Lys	Gln	Ala	Glu 220	Ala	Thr	Arg	Leu		
Lys 225	Lys	Ile	Lys	Thr	Asp 230	Arg	Glu	Gln	Ala	Glu 235	Ala	Thr	Arg	Leu	Glu 240		
Asn	Ile	Lys	Thr	Asp 245	Arg	Glu	Lys	Ala	Glu 250	Glu	Ala	Lys	Arg	Lys 255	Ala		
Glu	Ala	Glu	Glu 260	Val	Lys	Asp	Lys	Leu 265	Lys	Arg	Arg	Thr	Lys 270	Arg	Ala		
Val	Pro	Gly 275	Glu	Pro	Ala	Thr	Pro 280	Asp	Lys	Lys	Glu	Asn 285	Asp	Ala	Lys		
Ser	Ser 290	Asp	Ser	Ser	Val	Gly 295	Glu	Glu	Thr	Leu	Pro 300	Ser	Pro	Ser	Leu		
Lys 305	Ser	Gly	Lys	Lys	Val 310	Ala	Glu	Ala	Glu	Lys 315	Lys	Val	Ala	Glu	Ala 320		
Glu	Lys	Lys	Ala	Lys 325	Asp	Gln	Lys	Glu	Glu 330	Asp	Arg	Arg	Asn	Tyr 335	Pro		
Thr	Asn	Thr	Tyr 340	Lys	Thr	Leu	Glu	Leu 345	Glu	Ala	Glu	Ser	Asp 350	Val	Lys		
Val	Lys	Glu 355	Ala	Glu	Leu	Glu	Leu 360	Val	Lys	Glu	Glu	Ala 365	Lys	Glu	Ser		
Arg	Asn 370	Glu	Glu	Lys	Val	Lys 375	Gln	Ala	Lys	Ala	Glu 380	Val	Glu	Ser	Lys		
Lys 385	Ala	Glu	Ala	Thr	Arg 390	Leu	Glu	Lys	Ile	Lys 395	Thr	Asp	Arg	Lys	Lys 400		
Ala	Glu	Glu	Ala	Lys 405	Arg	Lys	Ala	Ala	Glu 410	Glu	Asp	Lys	Val	Lys 415	Glu		

Lys Pro Ala Glu Gln Pro Gln Pro Ala Pro Ala Pro Gln Pro Glu Lys
 420 425 430
 Pro Ala Pro Ala Pro Lys Pro Glu Asn Pro Ala Glu Gln Pro Lys Ala
 435 440 445
 Glu Lys Pro Ala Asp Gln Gln Ala Glu Glu Asp Tyr Ala Arg Arg Ser
 450 455 460
 Glu Glu Glu Tyr Asn Arg Leu Thr Gln Gln Gln Pro Pro Lys Thr Glu
 465 470 475 480
 Lys Pro Ala Gln Pro Ser Thr
 485

<210> 67
 <211> 451
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 67
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Val Gly Val Ala Ser Val Val Val Ala Ser Leu Val Met Gly
 20 25 30
 Ser Val Val His Ala Thr Glu Asn Glu Gly Ala Thr Gln Val Pro Thr
 35 40 45
 Ser Ser Asn Arg Ala Asn Glu Ser Gln Ala Glu Gln Gly Glu Gln Pro
 50 55 60
 Lys Lys Leu Asp Ser Glu Arg Asp Lys Ala Arg Lys Glu Val Glu Glu
 65 70 75 80
 Tyr Val Lys Lys Ile Val Gly Glu Ser Tyr Ala Lys Ser Thr Lys Lys
 85 90 95
 Arg His Thr Ile Thr Val Ala Leu Val Asn Glu Leu Asn Asn Ile Lys
 100 105 110
 Asn Glu Tyr Leu Asn Lys Ile Val Glu Ser Thr Ser Glu Ser Gln Leu
 115 120 125
 Gln Ile Leu Met Met Asn Tyr Pro Thr Ile Thr Tyr Lys Thr Leu Glu
 130 135 140
 Leu Glu Ile Ala Glu Ser Asp Val Glu Val Lys Lys Ala Glu Leu Glu
 145 150 155 160
 Leu Val Lys Val Lys Ala Asn Glu Pro Arg Asp Glu Gln Lys Ile Lys
 165 170 175
 Gln Ala Glu Ala Glu Val Glu Ser Lys Gln Ala Glu Ala Thr Arg Leu
 180 185 190
 Lys Lys Ile Lys Thr Asp Arg Glu Glu Ala Glu Glu Glu Ala Lys Arg
 195 200 205

Arg Ala Asp Ala Lys Glu Gln Gly Lys Pro Lys Gly Arg Ala Lys Arg
 210 215 220
 Gly Val Pro Gly Glu Leu Ala Thr Pro Asp Lys Lys Glu Asn Asp Ala
 225 230 235 240
 Lys Ser Ser Asp Ser Ser Val Gly Glu Glu Thr Leu Pro Ser Pro Ser
 245 250 255
 Leu Lys Pro Glu Lys Lys Val Ala Glu Ala Glu Lys Lys Val Glu Glu
 260 265 270
 Ala Lys Lys Lys Ala Glu Asp Gln Lys Glu Glu Asp Arg Arg Asn Tyr
 275 280 285
 Pro Thr Asn Thr Tyr Lys Thr Leu Glu Leu Glu Ala Glu Ser Asp Val
 290 295 300
 Glu Val Lys Lys Ala Glu Leu Glu Leu Val Lys Glu Glu Ala Lys Glu
 305 310 315 320
 Pro Arg Asn Glu Glu Lys Val Lys Gln Ala Lys Ala Glu Val Glu Ser
 325 330 335
 Lys Lys Ala Glu Val Glu Ser Lys Lys Ala Glu Ala Thr Arg Leu Glu
 340 345 350
 Lys Ile Lys Thr Asp Arg Lys Lys Ala Glu Glu Glu Ala Lys Arg Lys
 355 360 365
 Ala Ala Glu Glu Asp Lys Val Lys Glu Lys Pro Ala Glu Gln Pro Gln
 370 375 380
 Pro Ala Pro Ala Pro Lys Ala Glu Lys Pro Ala Pro Ala Pro Lys Pro
 385 390 395 400
 Glu Asn Pro Ala Glu Gln Pro Lys Ala Glu Lys Pro Ala Asp Gln Gln
 405 410 415
 Ala Glu Glu Glu Tyr Ala Arg Arg Ser Glu Glu Glu Tyr Asn Arg Leu
 420 425 430
 Thr Leu Gln Gln Pro Pro Lys Thr Glu Lys Pro Ala Gln Pro Ser Thr
 435 440 445
 Pro Lys Thr
 450

<210> 68
 <211> 730
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 68
 Met Phe Ala Ser Lys Ser Glu Arg Lys Val His Tyr Ser Ile Arg Lys
 1 5 10 15
 Phe Ser Ile Gly Val Ala Ser Val Val Val Ala Ser Leu Phe Leu Gly
 20 25 30

Gly	Val	Val	His	Ala	Glu	Glu	Val	Arg	Arg	Gly	Asn	Asn	Leu	Thr	Val
		35					40					45			
Thr	Ser	Ser	Gly	Asp	Glu	Val	Glu	Ser	His	Tyr	Gln	Ser	Ile	Leu	Glu
	50					55					60				
Lys	Val	Arg	Lys	Ser	Leu	Glu	Lys	Asp	Arg	His	Thr	Gln	Asn	Val	Asp
65					70					75					80
Leu	Ile	Lys	Lys	Leu	Gln	Asp	Ile	Lys	Arg	Thr	Tyr	Leu	Tyr	Asn	Leu
				85					90					95	
Lys	Glu	Lys	Pro	Glu	Ala	Glu	Leu	Thr	Ser	Lys	Thr	Asn	Lys	Glu	Leu
			100					105					110		
Asp	Ala	Ala	Phe	Glu	Lys	Phe	Lys	Lys	Glu	Pro	Glu	Leu	Thr	Lys	Lys
		115					120					125			
Leu	Ala	Glu	Ala	Glu	Lys	Lys	Ala	Lys	Asp	Gln	Lys	Glu	Glu	Asp	His
	130					135					140				
Arg	Asn	Tyr	Pro	Thr	Asn	Thr	Tyr	Lys	Thr	Ile	Glu	Leu	Glu	Ile	Ala
145					150					155					160
Glu	Ala	Glu	Val	Gly	Val	Ala	Lys	Ala	Glu	Leu	Glu	Leu	Ala	Gln	Ala
				165					170					175	
Gln	Val	Gln	Ile	Pro	Gln	Asp	Thr	Glu	Lys	Ile	Asn	Ala	Ala	Lys	Ala
			180					185					190		
Lys	Val	Glu	Ala	Ala	Lys	Ser	Asn	Val	Lys	Lys	Leu	Glu	Lys	Ile	Lys
		195					200					205			
Ser	Asp	Ile	Glu	Lys	Thr	Tyr	Leu	Tyr	Lys	Leu	Asp	Asn	Ser	Thr	Lys
	210					215					220				
Glu	Thr	Pro	Lys	Ser	Arg	Val	Arg	Arg	Asn	Ser	Pro	Gln	Val	Gly	Asp
225					230				235						240
Ser	Arg	Glu	Leu	Lys	Glu	Thr	Ile	Asp	Lys	Ala	Lys	Glu	Thr	Leu	Ser
				245					250					255	
Thr	Tyr	Met	Val	Thr	Arg	Leu	Thr	Lys	Leu	Asp	Pro	Ser	Val	Phe	Trp
			260					265					270		
Phe	Ala	Asp	Leu	Leu	Met	Asp	Ala	Lys	Lys	Val	Val	Glu	Glu	Tyr	Lys
		275					280					285			
Thr	Lys	Leu	Glu	Asp	Ala	Ser	Asp	Lys	Lys	Ser	Val	Glu	Asp	Leu	Arg
	290					295					300				
Lys	Glu	Ala	Glu	Gly	Lys	Ile	Glu	Ser	Leu	Ile	Val	Thr	His	Gln	Asn
305					310					315					320
Arg	Glu	Lys	Glu	Asn	Gln	Pro	Ala	Pro	Gln	Pro	Gly	Gly	Gln	Ala	Gly
				325					330					335	
Gly	Ser	Met	Val	Val	Pro	Pro	Val	Thr	Gln	Thr	Pro	Pro	Ser	Thr	Ser
			340					345					350		

Gln Ser Pro Gly Gln Lys Ala Thr Glu Ala Glu Lys Lys Lys Leu Gln
 355 360 365
 Asp Leu Ile Arg Gln Phe Gln Glu Ala Leu Asn Lys Leu Asp Asp Glu
 370 375 380
 Thr Lys Thr Val Pro Asp Gly Ala Lys Leu Thr Gly Glu Ala Gly Lys
 385 390 395 400
 Ala Tyr Asn Glu Thr Arg Thr Tyr Ala Lys Glu Val Val Asp Lys Ser
 405 410 415
 Lys Lys Leu Leu Ser Gln Thr Ala Val Thr Met Asp Glu Leu Ala Met
 420 425 430
 Gln Leu Thr Lys Leu Asn Asp Ala Met Ser Lys Leu Lys Glu Ala Lys
 435 440 445
 Ala Lys Leu Val Pro Glu Val Lys Pro Gln Pro Glu Asn Pro Glu Pro
 450 455 460
 Lys Pro Gln Pro Glu Gly Glu Lys Pro Ser Val Pro Asp Ile Asn Gln
 465 470 475 480
 Glu Lys Glu Lys Ala Lys Leu Ala Ile Ala Thr Tyr Met Ser Lys Ile
 485 490 495
 Leu Asp Asp Ile Lys Lys His His Leu Lys Lys Glu Lys His His Gln
 500 505 510
 Ile Val Ala Leu Ile Lys Asp Leu Asp Lys Leu Arg Lys Gln Ala Leu
 515 520 525
 Ser Glu Ile Asp Asn Val Asn Thr Lys Val Glu Ile Glu Asn Thr Val
 530 535 540
 His Lys Val Phe Ala Asp Met Asp Thr Val Val Thr Lys Phe Gln Lys
 545 550 555 560
 Gly Leu Ile Gln Asn Thr Pro Gln Val Pro Glu Ala Gln Arg Ala Gln
 565 570 575
 Arg Tyr Gln Arg Phe Gln Ile His Gln Lys Ala Pro Asp Thr Pro Gln
 580 585 590
 Val Pro Glu Ala Pro Lys Ser Pro Glu Val Pro Lys Val Pro Glu Ala
 595 600 605
 Pro Lys Ala Pro Asp Thr Pro Gln Val Pro Glu Ala Pro Lys Ser Pro
 610 615 620
 Glu Val Pro Lys Val Ser Asp Thr Pro Lys Ala Pro Asp Thr Pro Gln
 625 630 635 640
 Val Pro Glu Ala Pro Lys Ser Pro Glu Val Pro Lys Val Pro Glu Ala
 645 650 655
 Pro Lys Ala Pro Asp Thr Pro Gln Val Pro Glu Ala Pro Lys Ser Pro
 660 665 670
 Glu Val Pro Lys Val Pro Asp Thr Pro Lys Ala Pro Asp Thr Pro Gln

675	680	685
Val Pro Glu Ala Pro Lys Ala Pro Asp Thr Pro Gln Ile Pro Glu Ala		
690	695	700
Pro Ala Pro Glu Thr Pro Ala Pro Ala Pro Glu Ala Pro Lys Thr Gly		
705	710	715
		720
Trp Lys Gln Glu Asn Gly Met Trp Lys Gly		
	725	730

<210> 69
 <211> 2349
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 69

aattcgccct	tcgacgaata	gctgaagagg	aaaagctatt	acatgaagtt	ataatcccaa	60
atggaagcat	aaagagataa	atacaaaatt	cgattttatat	acagttcata	ttgaagtgat	120
atagtaaggc	ttaaagaaaa	atatagaagg	aaataaacat	gtttgcatca	aaaagcgaaa	180
gaaaagtaca	ttattcaatt	cgtaaattta	gtattggagt	agctagtgtg	gtagttgcta	240
gtttgttctt	aggaggagta	gttcacgcag	aagagggttag	aagaggggaat	aacctcacgg	300
ttacatctag	tgggggatgaa	gtcagagtcgc	attatcaaag	tatattggag	aagggtcagaa	360
aaagtttggg	aaaagatcga	catacccaaa	atgtcgactt	aatcaaaaaag	ttgcaagaca	420
ttaagagAAC	gtatttgtat	aatttaaaag	agaagccgga	agctgagttg	acgtcaaaaa	480
caaataaaga	gttagacgca	gcttttgaga	agtttataaaa	agaaccagaa	cttactaaaa	540
aattagcaga	agctgagaaa	aaagccaagg	atcaaaaaga	agaagatcac	cgtaactacc	600
caaccaatac	ttacaaaaca	atcgaactgg	aaattgcgga	agcagaagta	gggggtcgcca	660
aggcagagct	tgagcttgca	caagctcaag	tccaaatacc	tcaagatact	gagaaaaatta	720
atgctgctaa	agctaaagta	gaagctgcta	aaagtaatgt	taaaaaacta	gaaaaaatta	780
aatcagatat	tgaaaaaacg	tatttgtata	aattagataa	ctcaaccaa	gaaacgccaa	840
aatctagagt	gcgaagaaat	tctccgcaag	taggcgattc	gagagaactt	aaggaaaacga	900
tagacaaagc	gaaagaaact	ctgtctacct	atatggtaac	tcgtttaacg	aagctggatc	960
catctgtttt	ttggtttgca	gatcttctta	tggatgctaa	gaaagttgtg	gaagaatata	1020
agacaaaatt	agaggatgct	tcagataaaa	aatcggtaga	agacttgcca	aaggaagcag	1080
aaggaaaaat	agagtctctt	atcgtgactc	accaaaatag	agaaaaagaa	aaccaaccag	1140
cacccaacc	aggaggacaa	gcaggtggtt	caatggttgt	accaccggtg	acgcaaacac	1200
ctccatcaac	ttcccaaagt	ccaggacaaa	aggcgaccga	agctgaaaag	aaaaagttac	1260
aagacttgat	tcgtcaattc	caagaagcct	tgaacaaact	agacgatgaa	acaaagactg	1320
ttccagatgg	ggctaaactc	acaggagaag	ctggaaaagc	ctataatgag	actagaactt	1380
atgcgaaaga	agttgttgac	aagagcaaga	agcttctatc	acagacagca	gtgacaatgg	1440
atgaattggc	aatgcaatta	accaaattga	acgatgccat	gtctaaattg	aaagaagcta	1500
aagcgaaatt	ggtaccagag	gttaaaccac	agccggaaaa	cccagagcca	aaaccacaac	1560
cagaggggtga	gaaaccaagc	gtaccagata	ttaatcagga	gaaagaaaaa	gctaaacttg	1620
ctatagcaac	atacatgagc	aagatttttag	atgatataaa	gaaacatcat	ctgaagaaag	1680
aaaaacatca	tcagattggt	gctcttatta	aggaccttga	taaacttaga	aagcaagcac	1740
tttctgaaat	tgataatgta	aataccaaaag	tagaaattga	gaatacagtc	cacaaggtat	1800
ttgcagacat	ggatacgggt	gttactaaat	tccaaaaagg	cttaattcag	aacacaccgc	1860
aggttccaga	agcccaaaga	gccagagggt	accaaagggt	tcagatacac	caaaagggtc	1920
cggacacacc	gcaggttcca	gaagcaccaa	agagcccaga	ggtaccaaag	gttccagaag	1980
caccaaaggc	tccggacaca	ccgcaagttc	cggaagcacc	aaagagccca	gaggtacca	2040
aggtttcaga	tacaccaaaag	gctccggaca	caccgcaggt	tccagaagca	ccaaagagcc	2100
cagaggttacc	aaaggttcca	gaagcaccaa	aggctccgga	cacaccgcaa	gttccggaag	2160
caccaaaagag	cccagaggta	ccaaagggtc	cagatacacc	aaaggctccg	gacacaccgc	2220
aggttccaga	agcaccaaag	gctccagaca	caccgcaaat	tccggaagca	ccagctccag	2280
aaactccggc	tccagctcca	gaagctccaa	aaacagggtg	gaaacaagaa	aacggtatgt	2340
ggaagggcg						2349

<210> 70

<211> 2405
<212> DNA
<213> Streptococcus pneumoniae

<400> 70
cggccgccag tgtgatggat atctgcagaa ttgcgccttc gacgaatagc tgaagaggaa 60
aagctattac atgaagttat aatcccaa at ggaagcataa agagataaat acaaaattcg 120
atttatatac agttcatatt gaagtgat agtaaggtta aagaaaaaat atagaaggaa 180
ataaacatgt ttgcatcaaa aagcgaaaaga aaagtacatt attcaattcg taaatttagt 240
attggagtag ctagtgtagt agttgctagt cttgttatgg gaagtgtggg tcatgcgacg 300
gagaatgagg gaattaccca agtagccact tcttataata aggcaaatga aagtcagaca 360
gaacatagga aagctgctaa acaagtcgat gaagatataa aaaaaatgtt gagtgagatc 420
caagaatata taaaaaaaat gttgagtgag atccaattag ataaaagaaa acatacccaa 480
aatgtcaact taaacagaaa gttgagcgca attcaaacga agtatattgta tgaattaaga 540
gttttaaaag agaagtcgaa aaaagaagag ttgacgtcaa aaacaaaaaa agagtttagac 600
gcagcttttg agaagtttaa aaaagaacca gaacttacta aaaaattagc agaagctaaa 660
caaaaagcca aggtcaaaa agaagaagat ttccgtaact acccaaccaa tacttacaaa 720
acgcttgaac ttgaaattgc tgagttcgat gtgaaagtta aagaagcggg gcttgaacta 780
gtaaaagagg aagctaaacc ccgaaacgag gaaaaaatta agcaagcaaa agcgaagtt 840
gagagtaaaa aagctgaggg tacaaggtta gaagaaatca agacagaacg taaaaaagca 900
gaagaagaag ctaaacgaaa agcagaagaa tctgagaaaa aagctgctga agccaaacaa 960
aaagtggata ctaaagagca aggtaaacca aagaggcggg caaaacgagg agtttctgga 1020
gagctagcaa cacctgataa aaaagaaaat gatgcgaagt cttcagattc tagcgtaggt 1080
gaagaaactc ttccaagccc atcccttaat atggcaa atg aaagtcagac agaacatagg 1140
aaagatgtcg atgaatatat aaaaaaaatg ttgagtgaga tccaattaga tagaagaaaa 1200
cataccctaa atgtcaactt aaacataaag ttgagcgcaa ttaaaacgaa gtatttgtat 1260
gaattaagtg ttttaaaaaga gaactcgaaa aaagaagagt tgacgtcaaa aaccaaaagca 1320
gagttaaccg cagcttttga gcagtttaaa aaagatacat tgaaaccaga aaaaaaggt 1380
gcagaagctg agaagaaggt tgaagaagct aagaaaaaag ccaaggatca aaaagaagaa 1440
gatcgccgta actaccaac caatacttac aaaacgcttg aacttgaaat tgctgagtcc 1500
gatgtgaaag ttaaaaaaagc ggagcttgaa ctagtaaaag aggaagctaa cgaatctcga 1560
aacgaggaaa aaattaagca agcaaaagag aaagttgaga gtaaaaaaagc tgaggctaca 1620
aggttagaaa aaatcaagac agatcgtaaa aaagcagaag aagaagctaa acgaaaagca 1680
gaagaatctg agaaaaaagc tgctgaagcc aaacaaaaaag tggatgctga agaataatgct 1740
cttgaagcta aaatcgctga gttggaatat gtaaaagaag gactagaaaa agagctcaaa 1800
gagattgatg agtctgactc agaagattat cttaaagaag gcctccgtgc tcctcttcaa 1860
tctaaattgg atacaaaaaa agctaaacta tcaaaacttg aagagttgag tgataagatt 1920
gatgagttag acgctgaaat tgcaaaactt gaagttcaac ttaaagatgc tgaaggaaac 1980
aataatgtag aagcctactt taaagaaggt ttagagaaaa ctactgctga gaaaaaagct 2040
gaattagaaa aagctgaagc tgaccttaag aaagcagttg atgagccaga aactccagct 2100
ccggtcctc aaccagctcc agctccagaa aaaccagctg aaaaaccagc tccagctcca 2160
gctccagaaa aaccagctcc agctccagaa aaaccagctg aaaaaccagc tgaaaaacca 2220
gctgaagaac cagctgaaaa accagctcca gctccagaaa aaccagctcc aactccagaa 2280
aaaccagctc caactccaga aactccaaaa acaggctgga aacaagaaaa cggtatgtgg 2340
tacttctaca atactgatgg ttcaatggca acaggctggc tccaaaacaa tggttcatgg 2400
tacta 2405

<210> 71
<211> 2773
<212> DNA
<213> Streptococcus pneumoniae

<220>
<221> misc_feature
<222> (1)..(2773)
<223> nucleotide "n" can be any of the nucleotides "a",
"c", "g" or "t".

<400> 71
ccaagctatt aggtgacact atagaatact caagctatgc atcaagctta tgcttgtcaa 60

taatcacaaa	tatgtagatc	atatcttgtt	taggacagta	aaacatccta	attacttttt	120
aaatatctt	cctgagttga	ttggcttgac	cttggtttagt	catgcttatg	tgactttttgt	180
tttagttttt	ccagtttatg	cagttatttt	gtatcgacga	atagctgaag	aggaaaagct	240
attacatgaa	gttataatcc	caaatggaag	cataaagaga	taaatacaaa	attcgattta	300
tatacagttc	atattgaagt	aatatagtaa	ggttaaagaa	aaaatataga	aggaaataaa	360
catgttttgc	tcaaaaagcg	aaagaaaagt	acattattca	attcgtaaag	ttagtatttg	420
agtagctagt	gtagctgttg	ccagtcttgt	tatgggaagt	gtgggttcag	cgacagagaa	480
cgaggggaag	acccaagcag	ccaettcttc	taatatggca	aagacagaac	ataggaaagc	540
tgctaataca	gtcgtcgatg	aatatataga	aaaaatgttg	aggagagatt	aactagatag	600
aagaaaacat	acccaaaatg	tcgcctttaa	cataaagttg	agcgcaatta	aaacgaagta	660
tttgcggtga	ttaaatgttt	tagaagagaa	gtcgaaagat	gagttgccgt	cagaaataaa	720
agcaaagtta	gacgcagctt	ttgagaagtt	taaaaaagat	acattgaaac	caggagaaaa	780
ggtagcagaa	gctaagaaga	aggttgaaga	agctaagaaa	aaagccgagg	atcaaaaaga	840
agaagatcgt	cgtaactacc	caaccaatac	ttacaaaacg	cttgaacttg	aaattgctga	900
gttcgatgtg	aaagttaaag	aagcggagct	tgaactagta	aaagaggaag	ctaaagaatc	960
tcgaaacgag	ggcacaatta	agcaagcaaa	agagaaagtt	gagagtaaaa	aagctgaggc	1020
tacaaggtta	gaaaacatca	agacagatcg	taaaaaagca	gaagaagaag	ctaaacgaaa	1080
agcagatggg	aagttgaagg	aagctaattg	agcgacttca	gatcaaggta	aaccaaaagg	1140
gcgggcaaaa	cgaggagttc	ctggagagct	agcaacacct	gataaaaaag	aaaatgatgc	1200
gaagtcttca	gattctagcg	taggtgaaga	aactcttcca	agctcatccc	tgaaatcagg	1260
aaaaaaggta	gcagaagctg	agaagaaggt	tgaagaagct	gagaaaaaag	ccaaggatca	1320
aaaagaagaa	gatcgccgta	actacccaac	caatacttac	aaaacgcttg	accttgaaat	1380
tgctgagtc	gatgtgaaag	ttaaagaagc	ggagcttgaa	ctagtaaaag	aggaagctaa	1440
ggaacctcga	gacgaggaaa	aaattaagca	agcaaaagcg	aaagttgaga	gtaaaaaagc	1500
tgaggctaca	aggttagaaa	acatcaagac	agatcgtaaa	aaagcagaag	aagaagctaa	1560
acgaaaagca	gcagaagaag	ataaagttaa	agaaaaacca	gctgaacaac	cacaaccagc	1620
gccggtact	caaccagaaa	aaccagctcc	aaaaccagag	aagccagctg	aacaaccaa	1680
agcagaaaaa	acagatgatc	aacaagctga	agaagactat	gctcgtagat	cagaagaaga	1740
atataatcgc	ttgactcaac	agcaaccgcc	aaaaactgaa	aaaccagcac	aacctctac	1800
tccaaaaaca	ggctggaaac	aagaaaacgg	tatgtggtac	ttctacaata	ctgatggttc	1860
aatggcaaca	ggatggctcc	aaaacaacgg	ttcatggtac	tatctaaacg	ctaattggtc	1920
tatggcgaca	ggatggctcc	aaaacaatgg	ttcatggtac	tatctaaacg	ctaattggtc	1980
aatggcaaca	ggatggctcc	aaaacaatgg	ttcatggtac	tacctaaacg	ctaattggtc	2040
tatggcgaca	ggatggctcc	aatacaatgg	ttcatggtac	tacctaaaca	gcaatggcgc	2100
tatggcgaca	ggatggctcc	aatacaatgg	ttcatggtac	tacctcaacg	ctaattggtga	2160
tatggcgaca	ggatggctcc	aaaacaacgg	ttcatggtac	tacctcaacg	ctaattggtga	2220
tatggcgaca	ggatggctcc	aatacaacgg	ttcatggtat	tacctcaacg	ctaattggtga	2280
tatggcgaca	ggttgggtga	aagatggana	tacctggtac	tatcttaaag	catcagggtc	2340
tatgaaagca	agccaatggt	tcaaagtatc	agataaatgg	tactatgtca	atggctcagg	2400
tgcccttgca	gtcaacacaa	ctgtagatgg	ctatggagtc	aatgccaatg	gtgaatgggt	2460
aaactaaacc	taatataact	agttaatact	gacttcctgt	aagaactttt	taaagtattc	2520
cctacaaata	ccatatcctt	tcagtagata	atataccctt	gtaggaagtt	tagattaaaa	2580
aataactctg	taatctctag	ccggatttat	agcgctagag	actacggagt	ttttttgatg	2640
aggaaaagaat	ggcggcattc	aagagactct	ttaagagagt	tacgggtttt	aaactattaa	2700
gccttctcca	attgcaagag	ggcttcaatc	tctgctaggg	tgctagcttg	cgaaatggct	2760
ccacggagtt	tgc					2773

<210> 72

<211> 2489

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 72

gattgtatac	gaccactata	gggcgaattg	ggcccgcagct	cgcatgctcc	cggccgccat	60
------------	------------	------------	-------------	------------	------------	----

ggccgcgggt	attcgacgaa	tagctgaaga	ggaaaagcta	ttacatgaag	ttataatccc	120
aaatggaagc	ataaagagat	aaatacaaca	ttcgatttat	atacagttcc	tattgaagtg	180
atataataag	gttaaagaaa	aaatatagaa	ggaaataaac	atgtttgcat	caaaaagcga	240
aagaaaagta	cattattcaa	ttcgtaaatt	tagtattgga	gtagctagtg	tagctgttgc	300
cagcttgttc	ttaggaggag	tagtccatgc	agaaggggtt	agaagtggga	ataacctcac	360

ggttacatct	agtgggcaag	atatatcgaa	gaagtatgct	gatgaagtcg	agtcgcatct	420
agaaagtata	ttgaaggatg	tcaaaaaaaaa	tttgaaaaaa	gttcaacata	cccaaaatgt	480
cggcttaatt	acaaagttga	gcgaaattaa	aaagaagtat	ttgtatgact	taaaagttaa	540
tgttttatcg	gaagctgagt	tgacgtcaaa	aacaaaagaa	acaaaagaaa	agttaaccgc	600
aactttttgag	cagtttataaa	aagatacatt	accaacagaa	ccagaaaaaa	aggtagcaga	660
agctcagaag	aaggttgaag	aagctaagaa	aaaagccgag	gatcaaaaaag	aaaaagatcg	720
ccgtaactac	ccaaccatta	cttacaaaac	gcttgaactt	gaaattgctg	agtccgatgt	780
ggaagttaaa	aaagcggagc	ttgaactagt	aaaagtgaag	gctaagggaat	ctcaagacga	840
ggaaaaaatt	aagcaagcag	aagcgggaagt	tgagagttaa	caagctgagg	ctacaagggt	900
aaaaaaaaatc	aagacagatc	gtgaagaagc	taaacgaaaa	gcagatgcta	agttgaagga	960
agctgttgaa	aagaatgtag	cgacttcaga	gcaagataaa	ccaaagaggc	gggcaaaacg	1020
aggagtttct	ggagagctag	caacacctga	taaaaagaa	aatgatgcga	agtcttcaga	1080
ttctagcgta	ggtgaagaaa	ctcttccaag	cccatccctt	aatatggcaa	atgaaagtca	1140
gacagaacat	aggaaagatg	tcgatgaata	tataaaaaaa	atggttgagt	agatccaatt	1200
agatggaaga	aaacataccc	caaagtcaa	cttaaacata	aagttgagcg	caattaaaaac	1260
gaagtatttg	tatgaattaa	gtgtttttaa	agagaactcg	aaaaaagaag	agttgacgtc	1320
aaaaacccaa	gcagagttaa	ccgcagcttt	tgagcagttt	aaaaaagata	cattgaaacc	1380
agaaaaaaaa	gtagcagaag	ctgagaagaa	ggttgaagaa	gctaagaaaa	aagccaagga	1440
tcaaaaagaa	gaagatcgcc	gtaactaccc	aaccaatact	tacaaaacgc	ttgaacttga	1500
aattgctgag	tccgatgtga	aagttaaaga	agcggagctt	gaactagtaa	aagaggaagc	1560
taacgaatct	cgaaacgagg	aaaaaattaa	gcaagcaaaa	gagaaagttg	agagtaaaaa	1620
agctgaggct	acaagggttag	aaaaaatcaa	gacagatcgt	aaaaaagcag	agaagaagc	1680
taaacgaaaa	gcagaagaat	ctgagaaaaa	agctgctgaa	gccaaacaaa	aagtggatgc	1740
tgaagaatat	gctcttgaa	ctaaaatcgc	tgagttggaa	tatgaagttc	agagactaga	1800
aaaagagctc	aaagagattg	atgagctctga	ctcagaagat	tatcttaaag	aaggcctccg	1860
tgctcctctt	caatctaaat	tgataccaa	aaaagctaaa	ctatcaaaac	ttgaagagtt	1920
gagtgataag	attgatgagt	tagacgctga	aattgcaaaa	cttgaagttc	aacttaaaga	1980
tgctgaagga	aacaataatg	tagaagccta	ctttaaagaa	ggtttagaga	aaactactgc	2040
tgagaaaaaa	gctgaattag	aaaaagctga	agctgacctt	aagaaagcag	ttgatgagcc	2100
agaaactcca	gctccggctc	ctcaaccagc	tccggctcca	gaaaaaccag	ctgaaaaacc	2160
agctccagct	ccagctccag	aaaaaccagc	tccagctcca	gaaaaaccag	ctccagctcc	2220
agaaaaacca	gctccagctc	cagaaaaacc	agctccagct	ccagaaaaac	cagctccagc	2280
tccagaaaaa	ccagctccag	ctccagaaaa	accagctcca	gctcctaatac	cagaaactcc	2340
agaaacaggc	tggaaacaag	aaaacggtat	gtggtacttc	tacaatactg	atggttcaat	2400
ggcaacaggc	tggctccaaa	acaatggctc	atggtactac	ctcaacagca	atggcgttat	2460
ggcgacagga	tggttcccaa	acaatggctc				2489

<210> 73

<211> 1680

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 73

attgtatacg	actcactata	gggcgaattg	ggcccgcagt	cgcattgctcc	cggccgccat	60
ggccgcggga	ttcgacgaat	agctgaagag	gaaaagctat	tacatgaagt	tataatccca	120
aatggaagca	taaagagata	aatacaaaat	tcgatttata	tacagttcat	attgaagtga	180
tatagtaagg	ttaaagaaaa	aatatagaag	gaaataaaca	tgtttgcatc	aaaaaacgaa	240
agaaaagtac	attattcaat	tcgtaaattt	agtattggag	tagctagtgt	agctgttgcc	300
agtcttttta	tgggaagtgt	ggttcattgc	acagagaagg	aggtaactac	ccaagtagcc	360
acttctttta	ataaggcaaa	taaaagttag	acagaacata	tgaaagctgc	taaacaagtc	420
gatgaatata	taacaaaaaa	gctccaatta	gatagaagaa	aacataccca	aaatgtcggc	480
ttactcaca	agttgggcgt	aattaaaacg	gagtatttgc	atagattaag	tgtttcaaaa	540
gagaagtcgg	aagctgagtt	gccgtcagaa	ataaaaagcaa	agttagacgc	agcttttagag	600
cagtttataaa	aagatacatt	accaacagaa	ccaggaaaaa	aggtagcaga	agctgagaag	660
aaggttgaag	aagctaagaa	aaaagccgag	gatcaaaaaag	aagaagatcg	tcgtaactac	720
ccaaccatta	cttacaaaac	gcttgaactt	gaaattgctg	agtccgatgt	ggaagttaaa	780
aaagcggagc	ttgaactagt	aaaagaggaa	gctaagggat	ctcgaaacga	gcaaaaagtt	840
aaccaagcaa	aagcgaaagt	tgagagttaa	caagctgagg	ctacaagggt	aaaaaaaaatc	900
aagacagatc	gtgaacaagc	tgagactaca	aggttagaaa	acatcaagac	agatcgtgaa	960
aaagcagaag	aagctaaacg	aaaagcagat	gctaaagagc	aagatgaatc	aaagagggcg	1020

gtaaaaggag	gagttccggg	agagcaagca	acacttgata	aaaaagaaaa	tgatgcgaag	1080
tcttcagatt	ctagcgtagg	tgaagaaact	cttccaagcc	catccctgaa	atcaggaaaa	1140
aaggtagcag	aagctgagaa	gaaggttgca	gaagctgaga	aaaaagccaa	ggatcaaaaa	1200
gaagaagatc	gccgtaacta	cccaaccaat	acttacaaaa	cgcttgaact	tgaaattgct	1260
gagtcgatg	tgaaagttaa	agaagcggag	cttgaactag	taaaagagga	agctaaggaa	1320
tctcgaaacg	aggaaaaagt	taagcaagca	aaagcggaag	ttgagagtaa	aaaagctgag	1380
gctacaaggt	tagaaaaaat	caagacagat	cgtaaaaaag	cagaagaagc	taaacgaaaa	1440
gcagcagaag	aagataaagt	taaagaaaaa	ccagctgaac	aaccacaacc	agcgccggct	1500
cctcaaccag	aaaaaccagc	tccagctcca	aaaccagaga	atccagctga	acaacaaaaa	1560
gcagaaaaac	cagctgatca	acaagctgaa	gaagactatg	ctcgtagatc	agaagaagaa	1620
tataatcgct	tgactcaaca	gcaaccgcca	aaaactgaaa	aaccagcaca	accatctact	1680

<210> 74

<211> 1766

<212> DNA

<213> Streptococcus pneumoniae

<220>

<221> misc_feature

<222> (1)..(1766)

<223> nucleotide "n" can be any of the nucleotides "a",
"c", "g" or "t".

<400> 74

gtatacgact	cactataggg	cgaattgggc	ccgacgtcgc	atgctcccgg	ccgccatggc	60
cgcgggattc	gacgaatagc	tgaagaggaa	aagctattac	atgaagttat	aatcccaa	120
ggaagcataa	agagataaat	acaaaattcg	atcttatatac	agttcatatt	gaagtgat	180
agtaaggtta	aagaaaaaat	atagaaggaa	ataaacatgt	ttgcatcaaa	aagcgaaaga	240
aaagtacatt	attcaattcg	taaatttagt	gttggagtag	ctagtgtagt	tggtgccagt	300
cttgttatgg	gaagtgtggt	tcatgcgaca	gagaacgagg	gagctacca	agtaccact	360
tcttctaata	gggcaaatga	aagtcaggca	gaacaaggag	aacaacctaa	aaaactcgat	420
tcagaacgag	ataaggcaag	gaaagaggtc	gaggaatatg	taaaaaaaat	agtgggtgag	480
agctatgcaa	aatcaactaa	aaagcgacat	acaattactg	tagctctagt	taacgagttg	540
aacaacatta	agaacgagta	tttgaataaa	atagttgaat	caacctcaga	aagccaacta	600
cagatactga	tgatggagag	tcgatcaaaa	gtagatgaag	ctgtgtctaa	gtttgaaaag	660
gactcatctt	cttcgtcaag	ttcagactct	tccactaaac	cggaagcttc	agatacagcg	720
aagccaaaca	agccgacaga	accaggagaa	aaggtagcag	aagctaagaa	gaaggttgaa	780
gaagctgaga	aaaaagccaa	ggatcaaaaa	gaagaagatc	gtcgtaacta	cccaaccatt	840
acttacaaaa	cgcttgaact	tgaaattgct	gagtcgatg	tggaagttaa	aaaagcggag	900
cttgaactag	taaaagttaa	agctaacgaa	cctcgagacg	agcaaaaaat	taagcaagca	960
gaagcggaag	ttgagagtaa	acaagctgag	gctacaaggt	taaaaaaaat	caagacagat	1020
cgtgaagaag	cagaagaaga	agctaaacga	agagcagatg	ctaaagagca	aggtaaacca	1080
aaggggaggg	caaaacgagg	agttcctgga	gagctagcaa	cacctgataa	aaaagaaaa	1140
gatgcgaagt	cttcagattc	tagcgtaggt	gaagaaactc	ttccaagccc	atccctgaaa	1200
ccagaaaaaa	aggtagcaga	agctgagaag	aaggttgaag	aagctaagaa	aaaagccgag	1260
gatcaaaaag	aagaagatcg	ccgtaactac	ccaaccaata	cttacaaaa	gcttgaactt	1320
gaaattgctg	agtccgatgt	ggaagttaaa	aaagcggagc	ttgaactagt	aaaagaggaa	1380
gctaaggaa	ctcgaaacga	ggaaaaagtt	aagcaagcaa	aagcggaagt	tgagagtaaa	1440
aaagctgagg	ctactagggt	agaaaaaatc	aagacagatc	gtaaaaaagc	agaagaagaa	1500
gctaaacgaa	aagcagcaga	agaagataaa	gttaaagaaa	aaccagctga	acaaccacaa	1560
ccagcgccgg	ctccaaaagc	agaaaaacca	gctccagctc	caaaaccaga	gaatccagct	1620
gaacaaccaa	aagcagaaaa	accagctgat	caacaagctg	aagaagagta	tgctcgtaga	1680
tcagaagaag	aataataatcg	cttgactcta	cagcaaccgc	caaaaactga	aaaaccagca	1740
caaccatcta	ctccaaaaac	aanac				1766

<210> 75

<211> 1590

<212> DNA

<213> Streptococcus pneumoniae

<400> 75

```
aaactattac atgaagttat aatcccaa at ggaagcataa agagataaat aaaaaattcg 60
atztatatac agttcatatt gaagtgat agtaaggtta aagaaaaaat atagaaggaa 120
ataattatgt ttgcatcyaa aagcgaaaga aaagtacatt attcaattcg taaatttagt 180
attggagtag ctagtgtagc tgttgctagc ttgttcttag gaggagtagt ccatgcagaa 240
ggggttagaa gtgagaatac cccaaggtt acatctagt gggatgaagt cgatgaatat 300
ataaaaaaaaa tggtgagtga gatccaatta gataaaagaa aacataccca caatttcgcc 360
ttaaacctaa agttgagcag aattaaaacg gagtatttgt ataaattaaa agttaatgtt 420
ttagaagaaa agtcaaaagc tgagttgacg tcaaaaacaa aaaaagaggt agacgcagct 480
tttgagaagt ttaaaaaaga tacattgaaa ctaggagaaa aggtagcaga agctcagaag 540
aaggttgaag aagctaagaa aaaagccaag gatcaaaaag aagaagatca ccgtaactac 600
ccaaccaata cttacaaaac gcttgaactt gaaattgctg agtccgatgt gaaagttaaa 660
gaagcggagc ttgaactatt gaaagaggaa gctaaaactc gaaacgagga cacaattaac 720
caagcaaaaag cgaaagttaa gagtgaacaa gctgaggcta caagggttaa aaaaatcaag 780
acagatcgtg aacaagctga ggctacaagg ttagaaaaca tcaagacaga tcgtgaaaaa 840
gcagaagaag ctaaacgaaa agcagaagca gaagaagtta aagataaact aaagaggcgg 900
acaaaacgag cagttcctgg agagccagca acacctgata aaaaagaaaa tgatgcgaag 960
tcttcagatt ctagcgtagg tgaagaaact cttccaagcc catccctgaa atcaggaaaa 1020
aaggtagcag aagctcagaa gaaggtagca gaagctgaga aaaaagccaa ggatcaaaaa 1080
gaagaagatc gccgtaacta cccaaccaat acttacaaaa cgcttgacct tgaaattgct 1140
gagtccgatg tgaaagttaa agaagcggag cttgaactag taaaagagga agctaaggaa 1200
tctcgaaacg aggaaaaagt taagcaagca aaagcgaaag ttgagagtaa aaaagctgag 1260
gctacaaggt tagaaaaaat caagacagat cgtaaaaaag cagaagaagc taaacgaaga 1320
gcagcagaag aagataaagt taaagaaaaa ccagctgaac aaccacaacc agcgccggct 1380
cctcaaccag aaaaaccaac tgaagagcct gagaatccag ctccagctcc aaaacctgag 1440
aatccagctg aacaaccaa agcagaaaaa ccagctgata aacaagctga agaagactat 1500
gctcgtagat cagaagaaga atataatcgc ttgactcaac agcaaccgcc aaaaactgaa 1560
aaaccagcac aaccatctac tccaaaaaca 1590
```

<210> 76

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer

<400> 76

cgacgaatag ctgaagagg 19

<210> 77

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer

<400> 77

cataccgttt tcttgtttcc agcc 24